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(54) Title: SPECIALLY FORMATTED PAPER BASED APPLICATIONS OF A MOBILE PHONE

(57) Abstract: A method and system for electronic data entry using an electronic reading device that detects at least one position of the electronic reading device relative to a predefined address pattern of a specially formatted surface. Data relating to the at least one detected position is transmitted, preferably via a wireless interface using a radio transceiver. The data is received by a separate electronic device that performs an operation using the received data, wherein the operation corresponds to an area on the address pattern that contains the at least one detected position. The operation, for example, can include initiating a hyperlink function.

SPECIALLY FORMATTED PAPER BASED
APPLICATIONS OF A MOBILE PHONE

BACKGROUND OF THE INVENTION

Technical Field of the Invention

The present invention relates in general to the communications field, and in particular to an interaction of an electronic reading device with an address pattern.

Description of Related Art

Numerous man-machine-interfaces (MMIs) exist for accepting user input and controlling user interaction with desktop and portable computers, personal digital assistance (PDAs), mobile phones, and other types of electronic devices. For example, a keyboard can be used to accept typed input and other types of commands, a mouse or a track-ball can be used to provide relative motion input as well as various types of point-and-click selections, a keypad can be used to provide input of numerical data and functional commands, navigational keys, or scrolling wheels can be used for scrolling lists or otherwise repositioning a cursor, voice recognition can be used for performing certain operations, and various types of touchpads or touchscreens can be used to provide absolute positional coordinate inputs. Each type of mechanism for accepting input and for supporting user interaction has benefits and disadvantages in terms of size, convenience, flexibility, responsiveness, and easy of use. Generally, the selection of a particular type of MMI is dependent upon the function of the application and the degree and type of interaction required.

With the ever expanding capabilities and availability of applications both on the Internet and the area of wireless technology, there continues to be a need to develop and provide new MMIs for accepting input and interacting with users. In particular, some of the existing technologies suffer from

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drawbacks or limitations, such as size and flexibility, that
make them impractical and/or inconvenient to use in some
situations. For example, MMIs that are typically used with
mobile phones are not very fast and are not particularly user

5   friendly, especially for sending long SMS messages or changing
a lot of data in the device. Typically, long messages are
entered using T9 (i.e., word predictive input), a keyboard
attached to the phone (i.e., a chatboard), a pen on a touch
sensitive screen, or a numeric keypad where each key has to be

10   pressed more than once to enter certain letters. Each of these
alternatives suffer from a lack of speed and/or user-
friendliness. By expanding the range of possible MMIs for
supporting user interaction, application developers and end-
users can have greater flexibility in the selection of input

15   devices. Preferably, any such new mechanisms will provide
increased flexibility and will maximize user convenience. In
addition, the development of new mechanisms for interacting
with users can expand the realm of potential applications.

        For example, while a keyboard typically provides a great

20   deal of flexibility, particularly when it is used in connection
with a mouse, a touchscreen, or other navigational device, its
size makes it inconvenient in many cases, especially in the
wireless context.

SUMMARY OF THE INVENTION

25   The present invention comprises a method and system for
data entry using an electronic pen. At least one position on
a specially formatted surface is detected using an optical
detector of the electronic pen that detects a portion of an
address pattern of the specially formatted surface. Data

30   relating to the at least one detected position is transmitted
via a wireless interface to a separate electronic device. The
data received by the electronic device is then used to perform

an operation corresponding to an area of the predefined address pattern that contains the at least one detected position.

In accordance with a preferred embodiment of the invention, the separate electronic device is a mobile phone, PDA, personal or laptop computer, or other electronic device. The position on the address pattern at which the electronic pen is detected can be used to perform one of a variety of different functions, such as manipulating settings; navigating an options menu; performing mouse-like navigation on a screen of the separate electronic device; entering, manipulating, or deleting data in a personal information management application; composing an email, telefax, or short message service (SMS) message; dialing a telephone number; and the like.

Preferably, a plurality of positions are detected by periodically detecting (e.g., numerous times per second) a portion of the address pattern that is currently adjacent to the optical sensor of the electronic pen. Accordingly, the detected positions provide an electronic representation of handwritten text or drawn images. The handwritten or drawn text or images can then be stored or converted into ASCII text. Furthermore, the information written or otherwise input using the electronic pen can be utilized by a user of a mobile phone, PDA, television, personal computer, or other electronic device to execute a function within the mobile phone, PDA, television, personal computer, or other device.

In another aspect of the invention, when a portion of the address pattern is detected, the detected portion is compared with different areas of address patterns stored in a database memory to identify a function that corresponds to the detected portion of the address pattern. Once a specific function is identified, a controller or processor performs the specific function.

In one embodiment, the electronic reading device stores and performs a few basic functions corresponding to particular address patterns. In addition, instead of identifying and performing the function based solely on the detected pattern, the function can be initiated by writing a specific symbol either in any location or over a particular pattern. For example, the function might include storing or deleting information in the electronic reading device, sending information to another electronic device via a radio interface, and/or sending information to an Internet address.

In another embodiment, different areas of a specially formatted surface that includes various portions of an address pattern can be associated with different functions or applications. For example, the surface can be a paper having fields associated with: handwriting to text translation, language translation of messages, spell help, word translation wherein an audio translation is delivered to a mobile phone, accessing web pages, creating an electronic credit card receipt, sending information relating to a product or purchase, initiating a search on a search engine, and/or signature recognition. The particular function performed can be downloaded to the electronic reading device or to a related device for execution or might be executed in a remote server.

Furthermore, the formatted surface might include preprinted icons associated with specific functions or with a retrieval of specific information. Moreover, sheets of paper that include different address patterns can be organized into a notebook, wherein a detection of a particular address pattern allows the particular sheet of paper to be identified.

In yet another aspect of the invention, the present invention comprises a method and system for selecting a hyperlink and for providing a response to the selection. In particular, the hyperlink is printed, displayed, or otherwise

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included on a formatted surface. The area of the formatted surface on which the hyperlink is printed or displayed includes a unique address pattern that is formatted such that a position on the address pattern can be identified by detecting a part of the address pattern with an electronic reading device. Once the electronic reading device detects the address pattern, a corresponding Internet address is identified, and a message indicating the detection/selection is sent to a server at the identified Internet address. The server then performs an operation that corresponds to the selected hyperlink, such as sending information to a mobile station, computer, or email address of the electronic reading device user in response to the message.

Such a method and system can be used in connection with hyperlinks that perform a wide variety of different functions. For example, such a hyperlink system can be used to obtain more information about a product through a link on the web; connect to a web page using a link contained in a book or newspaper; retrieve an electronic version of an identification or business card; retrieve accurate transportation timetable information; replace bar codes or magnetic strips; retrieve additional information about exhibits at a museum, zoo, or other attraction; automatically activate special office messages; automatically verify location for delivery persons; or identify and authenticate tickets.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is made to the following detailed description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a block diagram of a system in which an electronic pen can be used as an input device;

FIGURE 2 is a schematic diagram of a system for supporting use of the electronic pen.described in connection with FIGURE 1;

FIGURE 3 is an illustration of the protocol stacks that can be used in the case of local communications between an electronic pen and an electronic pen client;

FIGURE 4 is an illustration of protocol stacks that can be used when an electronic pen and an electronic pen client communicate with one another via an Internet connection;

FIGURE 5 is an illustration of a protocol stack for communications between an electronic pen client and each of the supporting entities when the electronic pen client is not located within a server on the Internet;

FIGURE 6 is an illustration of protocol stacks that are used for communications between an electronic pen client and each of the supporting entities when the electronic pen client is located on the Internet;

FIGURE 7 is a block diagram of the electronic pen logic that handles positions, strokes, actions, and grid descriptions;

FIGURE 8 is a block diagram of a state machine for the electronic pen control block shown in FIGURE 7;

FIGURE 9 is a block diagram of a state machine for an electronic pen client;

FIGURES 10A-10C are a message flow and signaling diagram illustrating the operation of the electronic pen system shown and discussed in connection with FIGURE 2;

FIGURE 11 is an illustration of a reusable calendar reentry sheet;

FIGURE 12 is an illustration of an example of a reusable phone settings entry sheet;

FIGURES 13A and 13B are illustrations of an electronic pen 10 having a paper touch sensor.

FIGURE 14 is a block diagram of some of the basic elements of the electronic pen in accordance with a preferred embodiment of the present invention;

FIGURE 15 is an example of several areas having associated functions in accordance with one embodiment of the present invention;

FIGURE 16 is an illustrative example of a credit card receipt for use in connection with the present invention;

FIGURE 17 is an example of a preprinted paper for triggering selected functions in accordance with another embodiment of the present invention;

FIGURE 18 is an illustrative example of an email form according to another embodiment of the present invention;

FIGURE 19 is yet another illustrative example of a possible email form according to an alternative embodiment of the present invention; and

FIGURE 20 is a schematic diagram of a hyperlink system in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a system in which an electronic reading device, such as an electronic pen, an electronic mouse, or a hand scanner, works in cooperation with an address pattern (e.g., a specially formatted paper) to provide for a detection of a location of the electronic reading device over the address pattern. For instance, a pattern of dots can be defined such that, by examining a very small portion of the pattern, a precise location in the overall pattern can be determined. In fact, it is possible to define a pattern that has the size of 73,000,000,000,000 A4 pages, which is equivalent to half the size of the entire United States. Portions of the pattern can be placed on sheets of paper or other objects.

Then, using an electronic scanner pen that can detect the dots in the pattern, it is possible to detect the location of the pen with respect to the unique pattern. For example, when such a pen is used in connection with a specially formatted paper, the pen can detect its position (e.g., using a built in camera) by detecting a 3 mm by 3 mm portion of the pattern. By taking approximately 100 pictures per second, the pen is capable of determining its exact position to within 0.1 mm or less. This system can be used to provide user input, to facilitate user interaction, or to store handwritten notes or drawings. Moreover, by associating portions of the overall pattern with certain applications, such a system can be used to interact with wide variety of applications.

Referring now to FIGURE 1, there is illustrated an example of a system 2 in which an electronic pen can be used as an input device. The electronic pen includes an ink cartridge and is capable of writing in a typical fashion. The electronic pen 10, however, includes some type of sensor (e.g., a built-in camera or optical detector) that is used for detecting an address pattern on a specially formatted piece of paper 12. In particular, the paper 12 is formatted with a small portion of a large address pattern (i.e., a portion of the address pattern is printed on the paper 12) such that when the electronic pen 10 is used to write on or otherwise make marks on the paper 12, the writings or markings can be electronically detected and stored.

As an example, the paper 12 might constitute a form that can be used for sending an e-mail. Thus, the paper 12 might include a space for writing in the e-mail address of an intended recipient, a space for writing a subject of the e-mail, and a space for writing the body of the e-mail. As the electronic pen 10 is used to fill in each of the spaces, the position and movement of the electronic pen 10 on the paper 12

can be determined by repeatedly detecting the current x, y coordinates of the pen 10 (e.g., at rate of 100 frames per second). The markings can then be converted into ASCII text using an appropriate handwriting recognition program. Once the user completes the form, the e-mail can be sent, for example, by checking a send box at a predetermined location on the paper 12.

Preferably, the coordinate information collected by the pen 10 is sent by a short range radio transmitter in the electronic pen 10 to a nearby mobile station 14 using a short range radio interface 16 such as a local wireless radio link (e.g., a local wireless radio link supported by Ericsson's Bluetooth™ wireless communications technology). Alternatively, instead of using a mobile station 14, the coordinate information could also be sent to, for instance, a desktop or portable computer, a personal digital assistant (PDA), a television, or a Bluetooth terminal. Moreover, instead of using a local wireless radio link, other types of local wireless links, such as Global System for Mobile Communication (GSM), such as inductive coupling and infrared light; other types of radio links; or wired transmission media, such as a cable can also be used. The information can then be forwarded via an appropriate link, such as a cellular air interface 18, to a base station 20 or other network node.

As mentioned above, certain functions or applications can be associated with specific addresses or areas on the overall address pattern. The electronic pen 10 or an associated device, such as a mobile station 14, can then perform the function associated with an address when the address is read by the electronic pen 10. Assuming there are a large number of functions associated with different areas of the overall address pattern, there are a number of drawbacks to maintaining knowledge of all the various functions and their corresponding

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addresses within the electronic pen 10 itself. For example, it
would take a long time to define and develop in the electronic
pen 10 the function or functions that correspond to a certain
address space; memory demands and processing power requirements
in the electronic pen 10 would be extensive; and special
devices performing a limited number of specific applications
(i.e, a subset of all of the applications) would most likely
have to be developed.

In accordance with the present invention, instead of
having all functions and their corresponding addresses stored
in the electronic pen 10, the electronic pen 10 has knowledge
of only a few predetermined basic functions that allow it to
perform a specific subset of functions. Other devices with
which the electronic pen 10 can communicate (e.g., using a
Bluetooth interface) can then perform the remaining functions.
As an example, a particular address space can be associated
with the function of sending information that has been written
on an area of the address space to a URL on the Internet. The
server associated with the URL can have the intelligence to map
information written on certain areas of the address space to
their associated functions or appliances. Alternatively, the
URL server can store URL addresses to one or many other servers
that map an address space to the function(s) or application(s)
associated with it. In another alternative, a particular
address space can be associated with the function of sending
information that has been written on an area of the address
space to an electronic device, such as a mobile phone, laptap
computer, or desktop computer, with which the electronic pen 10
can communicate. By allowing one or more external devices to
provide a mapping between a particular address space and the
associated function or application, the system is very flexible
and easily expandable.

At the same time, the electronic pen 10 only needs to host mappings of a few of the most common and/or basic functions or applications. Thus, the electronic pen 10 might perform a special, predetermined function (as defined within the electronic pen memory) when the electronic pen 10 reads a predefined small address space. Similarly, the electronic pen 10 might perform a special, predetermined function (again as defined with the electronic pen memory) when a cross, circle, line, or other predetermined symbol is written on a predefined small address space. Either of these actions might be used to perform such special functions as: (1) sending information (or a request for information) to a URL on the Internet; (2) sending information (or a request for information) to a mobile phone or other specified electronic device; (3) sending information to a URL in the mobile phone or other specified electronic device; (4) storing information in the electronic pen 10; or (5) deleting information from the electronic pen 10.

Furthermore, the ability to perform certain functions in response to a written symbol is not necessarily limited to situations in which the symbol is written at a particular address space. Instead, the electronic pen 10 might be capable of recognizing special written patterns that trigger specific functions without requiring that the pattern be written in a preselected location on the address pattern. This pattern recognition capability can be supported either by instructions stored in the electronic pen memory or with the assistance of a server that is external (e.g., on the Internet) to the electronic pen 10 (e.g., using Internet web browsing protocols). As an example: writing "☺" could launch a photo with an email; writing "♡" could be automatically converted to "Love from John;" writing "⇒" could trigger retrieving an address book on a display, and writing "///" could represent a "SEND" command.

Referring now to FIGURE 14, there is illustrated a block
diagram of some of the basic elements of the electronic pen 10
in accordance with a preferred embodiment of the present
invention. The electronic pen 10 includes a microprocessor 250

5   that generally controls the operation of the electronic pen 10.
In particular, the microprocessor 250 controls communications
with other electronic devices using a Bluetooth transceiver 252
and receives coordinates detected by a pattern sensor 256. The
microprocessor 250 further compares position data received from

10   the pattern sensor 256 with predetermined symbols or patterns
stored in a function memory 254. When a detected symbol or
pattern matches a symbol or pattern, a function stored in the
function memory 254 that corresponds to the detected symbol or
pattern is executed by the electronic pen 10.

15   Some functions or applications are preferably handled by
a device external to the electronic pen 10, such as a server on
the Internet. In accordance with the present invention, when
the electronic pen 10 writes on a specific portion of the
address pattern, an application or web page, with or without

20   scripts, is automatically executed or downloaded to the
electronic pen 10 or to another device associated with the
electronic pen 10. Referring now to FIGURE 15, there is
illustrated an example of several areas having associated
functions in accordance with one embodiment of the present

25   invention. Handwritten messages or notes written using the
electronic pen 10 can be converted to text using a Handwriting
to Text Conversion Area 260. Once the handwritten message is
complete, the user touches the electronic pen 10 to a
designated "Convert" area 262, which causes the handwritten

30   document to be sent to a server that performs the conversion.
The resulting text could then be stored in a database or
delivered to an electronic device (e.g., a mobile phone or
personal digital assistant) for storage and/or display.

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Similarly, translations of handwritten words or phrases can be obtained using a predefined Translation Area 264. After the word or phrase is written into the area 264, the user selects the desired language for translating to by touching the

5   desired language in a language selection area 266 and requests the translation by touching the electronic pen 10 to a designated "Translate" command area 268. The result can then be sent, for example, to the user's mobile phone 14 and displayed as text or played as audio. Other analogous

10   functions include obtaining definitions of words, retrieving thesaurus entries, or obtaining spelling help.

Another possible function is obtaining access to a web page by writing a complete or abbreviated URL in a web access area 270 and touching a "Connect" command area 272. For

15   instance, writing "YAHOO" in the web access area 270 will cause a mobile phone or laptop in communication with the electronic pen 10 to automatically access the YAHOO! web page. Finally, writing a term or terms in a search area 274 and touching a "Search" command field 276 initiates a search engine, which

20   responds by providing search results to a phone or laptop that is in communication with the electronic pen 10.

Referring now to FIGURE 16, there is depicted an illustrative example of a credit card receipt 280 for use in connection with the present invention. The credit card receipt

25   280 includes a portion of the address pattern reserved for credit card receipts. When a total amount is entered in the "Total Amount" field 284 and the user signs the receipt 280 in the "Signature" field 282 using the electronic pen 10, a digital image of the signature and sum are automatically sent

30   to the credit card company by an application stored within the electronic pen 10 or in a server that is accessed by the electronic pen 10.

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Yet another example of a function that can be performed by reading a particular portion of the overall address pattern is retrieval of product information. When the electronic pen 10 reads a particular pattern (e.g., on a product package or in
5   an advertisement), a request can be sent to a remote server, which might respond to the request by sending product information to a mobile phone, PDA, television or computer associated with the user of the electronic pen 10. In addition, information might be sent to a retailer or
10   manufacturer.

Referring now to FIGURE 17, there is illustrated an example of a preprinted paper 290 for triggering selected functions in accordance with another embodiment of the present invention. By writing in a written input field 300 and then
15   touching the electronic pen 10 to an address field 298 (or by writing in a field dedicated to address inputs), an address recognition function might be triggered. Similarly, written input can be inserted in an email or a reply email by touching the pen 10 to an email field 294 or a reply field 296,
20   respectively. The preprinted paper might also include an icon field 292 that contains one or more icons that, when touched or clicked by the electronic pen 10, trigger a connection with a particular web address. Such icons can be sold, for example, to advertisers by the producer of the preprinted paper 290 or
25   the owner of a server that is associated with the portion of the address pattern included on the paper 290.

In one embodiment of the invention, preprinted paper 290, or paper that is otherwise allocated to particular functions, can be organized in a notebook that can include pages having
30   multiple different functions and/or multiple pages having the same function (e.g., it would be desirable to have a number of pages dedicated to sending an email to allow for many emails to be sent). The notebook and/or individual pages in the notebook

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can be identified by the address pattern printed thereon. Alternatively, individual pages might be distinguished by manually inserting a page number or name. Once identified, the page triggers an associated function or application in, for example, the electronic pen 10, in a mobile phone 14, or in a remote server. Preferably, the electronic pen 10 or a server monitors paper usage and prompts the user to buy new paper (e.g., by sending a message to the user on a phone or laptop with information from the paper manufacturer). In addition, an icon in the notebook might automatically initiate web access to a server where additional paper can be ordered or purchased.

Referring now to FIGURE 18, there is illustrated an email form 310 according to another embodiment of the present invention. Software in a server associated with the form 310 recognizes the form as an email form based on the underlying address pattern. The software further recognizes various fields on the email form 310. The page is identified by a page identification field 312, which distinguishes the page from other email forms 310. Several special function fields 314 are also included. When the electronic pen 10 is used to touch or "click on" one of these fields 314, the corresponding function can be performed. By writing a message and identifying an addressee or addressees in message field 316 and address fields 318, the server software will call a handwriting recognition application to convert the message into text and the address into a known email address. A similar form might also be used for other types of Intranet or Internet messaging with another individual or with a group (e.g., a chat area between a user and his or her secretary, a telefax, or a short message service (SMS) message).

Yet another example of a possible email form 320 is depicted in FIGURE 19. This form 320 also includes a message field 322, a variety of special function fields 324, and an

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address field 326. In this embodiment, however, the email form 320 includes a number of shortcut fields 328. By simply using the electronic pen 10 to touch or "click on" one of the shortcut fields 328, a word, image, number, symbol, or address can be inserted into the message field 322 or address field 326.

In one aspect of the present invention, new functions can be implemented simply by defining functions or applications that correspond to new portions of the overall address pattern. Such an implementation does not require a creation of any new protocols between the electronic pen 10 and an external server. One example of a new function includes using an address pattern to facilitate detection of whether a product is used or has been tampered with. If a package is opened, then a certain area that includes an address pattern is mechanically or chemically destroyed. If the address pattern cannot be detected by the electronic pen 10, then it is known that the product has been used or tampered with (e.g., for use in connection with airtight packages). Another example of a new function is for matching parts in an assembly. Thus, the parts of a house or table include addressed areas that can be detected using an electronic pen 10 to determine how and if the parts are designed to be attached together. An electronic pen 10 and addressed area could also be used for alcohol testing by testing whether a person can draw a straight line or follow a pattern to determine whether he or she is drunk.

In another example, an enlarged pattern could be painted on the ground so that a car, robot, or other moving object can determine its position. This could be used, for instance, for automatic robots that retrieve objects from shelves in a warehouse. Another possible new function is to use an electronic pen 10 and formatted surface for instantly scoring a school test, drivers' license test, etc. Answers selected or

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written by a test taker could be sent directly to a PC that
automatically scores the answer. Similarly, a form could be
used for statistics or voting, wherein a user's selection is
sent directly to a server on the Internet for computing

5   statistics or tabulating voting results. Finally, a particular
part of the address pattern could be used so that multiple
persons can enter information into a single electronic
document. For instance, family members could each have their
own paper that allows them to enter items in a common shopping

10   list that can be viewed on a mobile station 14 or PC. The
invention also allows scripts used for implementing functions
and applications to be executed either in the electronic pen 10
or in an external server.

Referring now to FIGURE 2, there is illustrated a

15   schematic diagram of a system 2 for supporting use of the
electronic pen 10 described in connection with FIGURE 1.
Throughout the subsequent discussion, the system 2 is described
primarily in connection with an electronic pen 10. It will be
understood, however, that the invention and the underlying

20   system 2 can instead use any type of electronic reading device,
such as an electronic pen, an electronic mouse, or a hand
scanner. As shown in FIGURE 2, the system 2 includes six
different entities, including the electronic pen 10, electronic
pen client 22, a control node 24, a name server 26, a base

25   translator 28, and an application server 30. Although these
various devices are described and depicted separately, it is
also possible to combine two or more of the entities into the
same device (e.g., the electronic pen 10 and electronic pen
client 22 can be contained in the same device).

30   The electronic pen 10 is responsible for detecting
positions on the address pattern, producing actions, and
sending information to the electronic pen client 22. In
addition to being able to leave pen markings, some electronic

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pens can also have the ability to produce other types of
output, such as sound, vibration, or flashing lights. The
electronic pen 10 includes a memory for storing a current grid,
which comprises information relating to an area of the address

5   pattern that is near the most recently detected position of the
electronic pen 10. When the electronic pen 10 is loaded with
the current grid, it knows what actions to take based on the
positions that are read from the address pattern. When the
electronic pen 10 is first turned on or when it moves to an

10   area outside of the current grid, the electronic pen 10 must
first request a new grid description before it can continue
processing information. In such a situation, the electronic
pen 10 requests a new grid description from the electronic pen
client 22.,

15   The electronic pen client 22 can be located in a mobile
station 14, in a PDA, in a television, in a desktop or portable
computer, in the electronic pen 10 itself, in a server
somewhere on the Internet, or in another device. The
electronic pen client 22 serves as the center of communications

20   in the overall system 2. In particular, the electronic pen
client 22 receives new grid requests and action requests from
the electronic pen 10 and responds to these requests by
contacting an appropriate entity within the overall system 2 to
properly respond to the request from the electronic pen 10.

25   Furthermore, when the electronic pen 10 is being used in
connection with a particular application, the electronic pen
client 22 can store the application and/or any corresponding
data received from the electronic pen 10 to facilitate
processing and use of the application.

30   The name server 26 is used for translating a detected
position on the address pattern into a Uniform Resource
Location (URL) associated with that position. Different
portions of the address pattern are assigned to different

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applications. Neither the electronic pen 10 nor the electronic pen client 22, however, is aware of all of the different applications and the particular areas assigned to each application. Thus, when the electronic pen 10 detects a new or unknown position, it forwards the position information to the electronic pen client 22, which in turn sends the information to the name server 26. The name server 26 then identifies an application associated with the received position and retrieves a URL where a description of the particular application can be found. The retrieved URL can then be used by the electronic pen client 22 to retrieve the application description.

As an alternative, the name server 26 can comprise a global name server that keeps track of a location, in the form of URLs to local name servers, where more information can be found about different addresses in the pattern. Similarly, each local name server can use other local name servers to obtain the necessary information, i.e., to convert a position into a URL where an application description can be found. At the lowest level, the local electronic pen client should know all the paper addresses that are within a specific application or applications.

There are some services that should be available in the overall system 2 for which it is inconvenient or not feasible to support such services in the electronic pen 10 or the electronic pen client 22. In such a case, the base translator 28 can be used to support the services. For example, the base translator 28 might contain handwriting recognition software for converting pen actions into text or for converting pen actions into a predefined set of symbols. When such services are needed, the electronic pen client 22 can send a request to the base translator 28 along with the necessary data, and the base translator 28 can perform the requested service.

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Another entity in the system 2 is a control node 24. The control node 24 is used for responding to actions in a standardized way. For example, the control node 24 can be used to respond to certain generic functions, such as "cancel" or "submit" functions, in a consistent manner without regard to the particular application that is currently active.

In addition, the control node 24 is used for creating streaming-like applications. For instance, some applications might require that the positions on the address pattern that are detected by the electronic pen 10 be immediately sent, upon detection, to the electronic pen client 22 for use by the application (i.e., the electronic pen 10 does not wait to transmit the position data until a complete stroke is detected or until a "send" field is touched). One example is an application that is used to control an industrial robot in a warehouse. In such a case, the application description that is loaded onto the electronic pen server 22 can include instructions that all positions be streamed to a control node 24. As a result, the control node 24 can receive the positions in real time and can control the robot without waiting for the form (i.e., the current grid) to be completed. Thus, the control node 24 can perform a real-time translation from detected positions to a responsive action, such as moving an object (e.g., a robot, a valve, etc.) or controlling a process.

The application server 30 is a regular web or wireless application protocol (WAP) server that supports an application associated with a particular area of the address pattern. The application server 30 stores an application description and provides the application description to the electronic pen client 22 upon request. In addition, the application server 30 receives input data from the electronic pen 10 via the electronic pen client 22. For example, the application description might define a number of data entry areas on a

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form. Thus when data is entered on the form by the electronic pen 10, the data is received by the electronic pen client 22, converted into text using handwriting recognition software, and forwarded to the application server 30, which stores the data or otherwise processes the data in accordance with the function of the application.

Referring now to FIGURES 3 through 6 there are illustrated various examples of protocol stacks that can be used for communicating between the entities shown in FIGURE 2. Generally, however, such protocols apply however, only if the two communicating entities are implemented in different devices. If two or more entities are combined into one device, a proprietary protocol can be used to communicate between the entities. FIGURE 3 illustrates the protocol stacks that can be used in the case of local communications (e.g., using Bluetooth™) between the electronic pen 10 and the electronic pen client 22. If, on the other hand, the electronic pen 10 and the electronic pen client 22 communicate with one another via an Internet connection, the protocol stacks depicted in FIGURE 4 will be used. FIGURE 5 illustrates a protocol stack for communicating between the electronic pen client and each of the supporting entities, such as the name server 26, the control node 24, the base translator 28, and the application server 30, when the electronic pen client 22 is not contained within a server on the Internet (e.g., such as when the electronic pen client 22 is located in a mobile phone 14). Finally, FIGURE 6 depicts the protocol stacks that are used when the electronic pen client 22 is located on the Internet.

There are a number of procedures that can be used by the various entities in the system 2 to allow the system to operate properly. When the electronic pen 10 detects a position on the address pattern that is not within its currently loaded grid or when the electronic pen 10 has no currently loaded grid, the

electronic pen 10 initiates a new grid procedure. The new grid procedure involves sending a new grid request object to the electronic pen client 22. The new grid request object contains the newly detected position, a description of the actions that the electronic pen 10 can natively support, and a description of the output signals that the electronic pen 10 supports. The reply to a new grid request object is a grid description, which can be provided by the electronic pen client 22 from its own internal memory or from the information provided by an application server 30. Generally, the electronic pen client 22 extracts the grid description from an application description received from the application server 30. The grid description should only contain action-field-types that the electronic pen 10 has indicated that it natively supports, which means that the electronic pen client 22 in some cases should convert the extracted grid description into a format that the electronic pen 10 can understand.

In some situations, it may be necessary for the electronic pen 10 to unload its current grid at the request of the electronic pen client 22. In such a case, the electronic pen client 22 sends an empty grid description to the electronic pen 10, thereby causing the electronic pen 10 to unload its current grid. This can occur, for example, when a particular application is complete or when a new grid description request received from the electronic pen 10 cannot be fulfilled, such as when the position received from the electronic pen 10 is not registered in the name server 26.

Another similar message is the empty grid description with a grid exception. When the electronic pen 10 requests a new grid description from the electronic pen client 22, the electronic pen client 22 uses the detected position specified in the request to ask the name server 26 for a URL where the application description can be found. If no URL is returned,

the electronic pen client 22 can send an empty grid description
with a grid exception to the electronic pen 10. The grid
exception comprises a rectangle or other shape indicating the
area around the detected position where no registered
applications can be found. Preferably, the indicated area is
as large as possible so that the electronic pen 10 and/or
electronic pen client 22 know the extent of the surrounding
area that is unassigned and do not have to repeatedly send
requests to the name server 26. Thus, the empty grid
description with a grid exception causes the electronic pen 10
to unload its current grid and also informs the electronic pen
10 of an area surrounding the detected position that can
essentially be ignored because its is not associated with any
application,.

The procedure that is used when the electronic pen 10
detects a new position is a find application description
location procedure. This procedure is used by the electronic
pen client 22 to translate a detected position received from
the electronic pen 10 into a URL where a description of an
application corresponding to that position can be found. The
procedure involves sending a request from the electronic pen
client 22 to the name server 26 containing identification of
the detected position. The name server 26 responds by sending
a reply to the electronic pen client 22 containing a URL where
an application description can be found or, if the detected
position is not registered in the name server 26, containing an
indication that no associated application is known to exist.

Once the electronic pen client 22 knows the URL where an
application description can be found, the electronic pen client
22 can initiate a get application description procedure, which
allows the electronic pen client 22 to retrieve the application
description from the application server 30. In particular, the
electronic pen client 22 sends an application description

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request containing a unique ID for the requesting electronic pen 10 and/or electronic pen client 22 to the application server 30 located at the URL address provided by the name server 26. In response, the application server 30 provides an application description object to the electronic pen client 22, which loads the application onto the electronic pen client 22. The application description object is similar to an HTML form with some additions and modifications.

Furthermore, the application description object can be sent from the application server 30 to the electronic pen client 22 in response to a submitted form (i.e., a submission of one completed form might automatically result in a new form being loaded onto the electronic pen client 22). A related procedure is the application submit procedure, which is used by the electronic pen client 22 when the user of the electronic pen 10 selects a "submit" field in a form. In response to the selection of the "submit" field, the electronic pen client 22 will submit the form content in accordance with instructions received in the application description. Typically, the electronic pen client 22 will submit the form content, in the same way as a regular web browser, to a URL specified in a form tag of the application description.

When an action that can be handled by the electronic pen 10 itself is generated, an action procedure is initiated by the electronic pen 10 to send an action request object to the electronic pen client 22. If the electronic pen client 22 cannot translate the action into a field value itself, the electronic pen client 22 further forwards the request to a base translator 28 for translating the action into a field value. In response to the action request object, an action reply object is sent from the electronic pen client 22 to the electronic pen 10. The action reply object contains output information that indicates to the electronic pen 10 which

outputs signals to use. The output information, however, cannot be of type that the electronic pen 10 has previously indicated that it does not support. In some instances, the action reply object might contain a new grid description. In
5 such a case the electronic pen 10 will unload its current grid description and load the new grid description. Similarly, if the action reply object contains an empty grid description, the electronic pen 10 will simply unload its current grid description.

10 The action request object is also sometimes used to specify actions that should be processed by the control node 24. In this instance, the electronic pen client 22 initiates a control procedure by forwarding the received action to the appropriate control node 24. As a result, the control node 24
15 sends an action reply object to the electronic pen client 22.

The operation of the electronic pen 10 will now be discussed in greater detail. Each electronic pen 10 has a unique pen ID, which is sent to the application server 30 when an application description is requested. The electronic pen ID
20 allows the application to identify the particular user that is using the application and to distinguish between multiple concurrent users of the same application, such as when different electronic pens 10 are being used in connection with separate sheets of paper that each contain the same portion of
25 the address pattern.

Referring now to FIGURE 7, there is illustrated a block diagram of the electronic pen processor logic that handles positions, strokes, actions, and grid descriptions for the electronic pen 10. The electronic pen 10 includes a control
30 block 32 for controlling the operation of the electronic pen 10. A grid description block 34 represents a memory location that stores a current grid description. At any given time, the electronic pen 10 can be in either of two modes. In a first

mode, a grid description is loaded, while in a second mode, the grid description block 34 is not loaded with a current grid description.

As the electronic pen 10 moves across an address pattern, the electronic pen 10 periodically (e.g., every 1/100 of a second) detects a position by detecting all of the dots within, for example, a 3mm by 3mm area. Each detected position is forwarded (as indicated at 36) to a position first in first out (FIFO) block 38, which acts as a buffer for temporarily storing the detected positions. The clocking of the position FIFO block 38 is controlled by the control block 32 (as indicated at 40).

The detected position is fed from the position FIFO block 38 (as indicated at 42) to an in grid detector 44. The in grid detector 44 retrieves data from the grid description block 34 (as indicated at 46) and determines whether the received position is within the loaded grid description. If not, the in grid detector 44 notifies the control block 32, which in turn initiates a request for a new grid. When the detected position is within the current grid, the position is then sent (as indicated at 50) from the in grid detector 44 to a stroke engine 52. The stroke engine 52 converts the received positions into strokes, which are then sent (as indicated at 54) to an action engine 56. A complete stroke is created when the electronic pen 10 is lifted from the paper or when it moves outside of the grid field where the stroke began. Finally, the action engine 56 converts the received stroke into an action that can be sent to the electronic pen client 22. By using grid action-field-types, the action engine knows which type of action to produce for a specific grid field.

Referring now to FIGURE 8, there is illustrated a block diagram of a state machine for the control block 32 shown in FIGURE 7. In this figure, events are indicated in capital

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letters, while tasks associated with the event are depicted in brackets. The process starts at step 60 with a start up event 62, which causes the position FIFO block 38 to begin receiving detected positions. Initially, the electronic pen 10 is in a no grid loaded state 64, which means that the electronic pen 10 does not have a grid loaded in the grid description block 34. As a result, the control block 32 generates an outside grid indication 66, thereby causing the electronic pen 10 to send the request for a new grid description to the electronic pen client 22 (i.e., in accordance with the new grid procedure) and to stop the FIFO buffer 38. At this point, the electronic pen 10 enters a waiting for grid state 68.

Once the new grid has been received (as indicated at 70), the control block 32 moves to a grid loaded state 72, at which time the new grid is loaded into the grid description block 34 and the position FIFO block 38 resumes operation. On the other hand, if no grid is received (as indicated at 74), at least a portion of the positions stored in the FIFO buffer 38 are erased. Which part of the FIFO buffer to erase is determined by the grid exception area, if any, in the received empty grid description. Accordingly, all positions stored in the FIFO buffer 38 that are within the grid exception area should be erased. If no grid exception is received, the stroke associated with the position is erased. In addition, the FIFO block 38 resumes operation and the control block 32 moves into the no grid loaded state 64.

When the control block 32 is in the grid loaded state 72, a current grid is loaded in the grid description block 34. While the control block 32 remains in this state 72, the position FIFO block 38 continues to receive detected positions and passes them on to the stroke engine 52 and action engine 56. Actions produced by the action engine 56 are sent (as

indicated at 58) to the electronic pen client 22 (i.e., in accordance with the action procedure described above).

At some point, an outside grid indication 74 may be received by the control block 32 from the in grid detector 44. The outside grid event 74 causes the FIFO block 38 to stop generating new positions. In addition, the electronic pen 10 enters a flushing stroke and action state 76 wherein the strokes that are currently in the stroke engine 52 and the actions that are currently in the action engine 56 are flushed to the electronic pen client 22. Once the stroke engine 52 and action engine 56 have been fully flushed (as indicated at 78), the electronic pen 10 sends a request for a new grid to the electronic pen client 22 and unloads the current grid. The control block 32 then moves back into the waiting for grid state 68.

As a general matter, the electronic pen 10 may be capable of supporting various different types of output, including audio, such as warning tones; visual, such as a flashing light; tactile, such as vibration; and/or ink. In some cases, it might be desirable to allow the user of the electronic pen 10 to turn off the ink of the pen 10, such as when the electronic pen is being used on a portion of the address pattern that is public or shared or when the user wants to be able to reuse the current sheet of paper.

The electronic pen client 22 will now be described in greater detail. Generally, the electronic pen client 22 is analogous to a regular web browser. It is responsible for loading applications from application servers 30 and for handling input form the electronic pen 10. Preferably, the electronic pen client 22 is located in a separate device from the electronic pen 10 itself. This is because it is desirable to minimize the size and power supply requirements of the electronic pen 10, which will likely be adversely affected by

the processing resources and memory necessary to support the functions of the electronic pen client 22.

Referring now to FIGURE 9, there is illustrated a block diagram of a state machine for the electronic pen client 22. Initially, the electronic pen client 22 is in a no application loaded state 80. The electronic pen client 22 recognizes only one signal when in this state 80, namely a new grid request from the electronic pen 10. Such a request causes a load grid indication event 82. The electronic pen client 22 responds by sending a request to the name server 26 to translate a position contained within the new grid request into a URL where the application description can be found (i.e., in accordance with the find application location procedure). Next, the electronic pen client 22 enters a waiting for application description URL state 84. If no URL for the application description can be found (as indicated at 86), the electronic pen client 22 sends a new grid reply to the electronic pen 10, wherein the reply contains an empty grid description with a grid exception. As a result, the electronic pen client 22 returns to the no application loaded state 80.

If a URL for the application description is received from the name server 26 (as indicated at 88), the electronic pen client 22 sends a request to the application server 30 to retrieve the application description (i.e., in accordance with the get application description procedure). Accordingly, the electronic pen client 22 enters a waiting for application description state 90.

If the electronic pen client 22 does not receive an application description from the application server 30 (as indicated at 92), a new grid reply is sent by the electronic pen client 22 to the electronic pen 10 wherein the reply contains an empty grid. Thus, the electronic pen client 22 returns to the no application loaded state 80. If, however,

the electronic pen client 22 does receive an application description from the application server 30 (as indicated at 94), the electronic pen client 22 sends a new grid reply to the electronic pen 10 containing a new grid description, and the electronic pen client 22 loads the application in its memory. In addition, the electronic pen client 22 moves into an application loaded state 96.

In the application loaded state 96, five types of actions can be received by the electronic pen client 22 from the electronic pen 10. First, ·a received action can include a request that the electronic pen client 22 cannot handle itself, in which case the electronic pen client 22 will send the action to the base translator 28 (as indicated at 98). The electronic pen client 22 then moves into a waiting for response from the base translator state 100. Once a base translator response 102 is received by the electronic pen client 22, the electronic pen client 22 updates a current form or other data associated with the currently loaded application and sends an action reply to the electronic pen 10 with appropriate output information.

Another type of action that the electronic pen client 22 can receive from the electronic pen 10 is a request that should be forwarded to a control node 24. In such a case, the action is sent to a control URL specified in the application description (as indicated at 104), and the electronic pen client 22 enters a waiting for response from the control state 106. Once a response is received from the control (as indicated at 108), the electronic pen client 22 sends an action reply to the electronic pen 10 with appropriate output information.

A third type of action is a submit form request, in response to which the electronic pen client 22 will submit the current form to the application server 30 that is identified by the URL in the application description (as indicated at 110).

The electronic pen client 22 then enters a waiting for response from the application server state 112. If the application server 30 responds by sending an empty application description to the electronic pen client 22 (as indicated at 114), the current application is unloaded from the electronic pen client 22 and an action reply is sent to the electronic pen 10 with an empty grid. As a result, the electronic pen client 22 returns to the no application loaded state 80. On the other hand, if the application server 30 responds with a non-empty application description, the old application is unloaded from the electronic pen client 22, the new application description is parsed and loaded in the electronic pen client 22, an action reply is sent to the electronic pen 10 with a new grid description and with appropriate output information, and finally the electronic pen client 22 returns to the application loaded state 96.

A fourth type of action that can be received by the electronic pen client 22 from the electronic pen 10 is a request to load a new grid. This action occurs, for example, when a position outside of the current grid is detected by the electronic pen 10. When a new grid request is received, the electronic pen client 22 sends a request to the name server 26 (as indicated at 116) and the electronic pen client 22 returns to the waiting for application description URL state 84.

Finally, a fifth type of action that can be received by the electronic pen client 22 is an action that the electronic pen client 22 can handle itself, in which case the electronic pen client 22 updates the current form and sends an action reply to the electronic pen 10 with appropriate output information (as indicated at 118). The electronic pen client 22 then remains in the application loaded state 96. One type of action that the electronic pen client 22 might be able to handle itself is a local application. For example, the

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electronic pen clien: 22 might be capable of performing certain basic functions that are defined by a local application. Thus, when the electronic pen client 22 receives a new grid request, the position assoc.a:.ed with the new grid request can be

5   analyzed to determine if it corresponds to a local application. If so, the electronic pen client 22 can load the application description from its local memory, send a new grid description to the electronic pen 10 without having to communicate with the name server 26 or the application server 30.

10   Another action that might be handled locally by the electronic pen client 22 relates to the selection of fields within a form. When the electronic pen client 22 receives an action, the field that corresponds to that action receives focus. When this occurs, the electronic pen client 22 might

15   display the field's value on its display or output the value by audio. In addition, the electronic pen client 22 might allow the user to edit the value of the field by means other than the electronic pen 10. Yet another type of action that might be handled by the electronic pen client 22 itself are actions that

20   relate to a clipboard function. When a "copy" field is selected, the value of the field that had focus at the time the copy field was selected is transferred to the clipboard. Similarly, when a "paste" field is selected, the value stored in the clipboard is transferred to the field that had focus at

25   the time the paste field was selected.

         Referring now to FIGURES 10A through 10C, there is shown, by way of example, a message flow and signaling diagram illustrating the operation of the electronic pen system 2 depicted in and discussed in connection with FIGURE 2.

30   Initially, the electronic pen 10 detects a first position on the address pattern at step 120 (e.g., at a location on a sheet of paper designated for composing and sending e-mails). At this stage, it is assumed that the electronic pen 10 is in a no

grid loaded state. Thus, in response to the detection of the first position, the electronic pen 10 sends a new grid request 122, which contains the detected position information, to the electronic pen client 22. As a result, the electronic pen

5   client 22 sends an application location request 124 containing the detected position information to the name server 26, at step 126. The name server 26 translates the detected position into a URL where an application description that corresponds to the detected position can be found (e.g., a URL address for a

10   server containing an e-mail application), and returns an application location reply 128 containing the retrieved URL to the electronic pen client 22.

The electronic pen client 22 then sends an application description request 130, which contains the unique pen ID for

15   the electronic pen 10, to the application server 30. The application server 30 retrieves the application description at step 132 and sends an application description reply 134 containing the retrieved application description to the electronic pen client 22. The electronic pen client 22 then

20   parses and stores the application description at step 136. This step further involves generating a current grid description from the application description and sending the grid description to the electronic pen 10 in a new grid reply 138. The electronic pen 10 stores the received grid

25   description at step 140 and resumes processing of the detected positions. Using the detected positions and the information in the grid description (e.g., so that the electronic pen 10 knows which fields of the e-mail form are being filled in), the electronic pen 10 generates strokes at step 142 and generates

30   actions at step 144 using the stroke engine 52 and action engine 56 shown in FIGURE 7.

Each time an action is generated that cannot be handled by the electronic pen 10 itself, an action request 146

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containing a description of the action is sent from the electronic pen 10 to the electronic pen client 22. At this point, the electronic pen client 22 should determine what type of action has been received so that it can respond to the

5   action in an appropriate manner. First, it is determined whether the action requires the attention of, or otherwise should be processed in accordance with, a local application at step 148. Very basic applications or frequently used applications (e.g., delete entered text), for example, might be

10   stored locally to avoid having to contact another entity. In such a case, the electronic pen client 22 retrieves the local application at step 150 and sends an action reply 152, which can contain a new grid description or other appropriate information.

15   However, if it is determined at step 148 that the received action does not relate to a local application, the process continues at step 154 where it is determined whether the received action requires processing by an external translator (e.g., handwriting recognition). If so, an action request 156

20   containing a description of the action is sent by the electronic pen client 22 to the base translator 28. The base translator 28 processes the action at step 158 and sends an action reply 160 containing output information responsive to the received action (e.g., text corresponding to written

25   characters) to the electronic pen client 22, which can forward the output information to the electronic pen 10 in an action reply 162, if necessary.

          If it is determined at step 154 that the received action does not require processing by an external translator, it is

30   next determined whether the action relates to a control application at step 164. If so, an action request 166 containing a description of the action is sent by the electronic pen client 22 to the control server 24. The control

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server 24 processes the received action at step 168 and, if a response is necessary, returns output information responsive to the received action in an action reply 170, which is forwarded from the electronic pen client 22 to the electronic pen 10 in

5   an action reply 172.

Assuming that it is determined at step 164 that the received action does not relate to a control function, it is next determined whether the action comprises a request to submit a form at step 174 (e.g., a selection of a "send" area

10   on the e-mail form). If so, an action request 176 containing the data entered onto the form is sent by the electronic pen client 22 to the application server 30. The application server 30 processes the form at step 178 and sends an action reply 180 containing a new application description (or an empty

15   application description) to the electronic pen client 22. The electronic pen client 22 parses and stores the new application description at step 182 and generates a new grid description from the newly received application description. The electronic pen client 22 then sends an action reply 184

20   containing the new grid description. Although not illustrated in the figure, the electronic pen 10 will typically respond to the receipt of a new grid description by unloading its current grid description and loading the new grid description into its memory.

25   At some point, it is assumed that the electronic pen 10 detects a position that is outside of the currently loaded grid at step 186. In response to such an event, the electronic pen 10 sends a new grid request 138 containing the newly detected position data to the electronic pen client 22. In response,

30   the electronic pen client 22 again generates an application location request 190 containing the detected position data and sends the request to the name server 26. The name server 26 determines whether a URL for an application description that

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corresponds to the newly detected position is available at step 192.

If so, the name server 26 sends an application location reply 194 containing a retrieved URL to the electronic pen client 22, which in turn sends an application description request 196 containing the unique pen ID for the electronic pen 10 to the application server 30 at the identified URL address, just as previously discussed in connection with messages 128 and 130. In this case, however, it is assumed that the application server 30 determines that the requested application description is unavailable at step 198. As a result, the application server 30 sends an application description reply to the electronic pen client 22 containing an empty application description. In response to the receipt of an empty application description, the electronic pen client 22 unloads the current application at step 202 and sends a new grid reply 204 containing an empty grid description to the electronic pen 10. The electronic pen 10 responds to the receipt of the empty grid description by unloading the current grid description at step 206.

Another possibility is that the name server 26 determines at step 192 that a URL corresponding to the detected position is not available. In this situation, the name server 26 sends an application location reply 208 to the electronic pen client 22. The reply 208 may simply be empty to indicate that a URL is not available. Preferably, however, the reply 208 contains a grid exception defining the largest area possible around the detected position for which there is no corresponding URL. In response to the reply 208, the electronic pen client 22 sends a new grid reply 210 containing an empty grid description with a grid exception. Upon receiving the reply 210, the electronic pen 10 unloads the current grid description at step 212. Furthermore, assuming that the electronic pen 10 receives and

recognizes the grid exception information, the electronic pen 10 may subsequently be able to determine that certain detected positions on the address pattern are not associated with any application without having to send a request to the name server 26 or the application server 30.

To implement the electronic pen 10, there should be some type of mechanism for allowing the electronic pen 10 to determine when to attempt to detect an address pattern, when to store detected positional information, and/or when to forward or transmit the detected positions to the electronic pen client 22. In addition, it is also desirable to allow a user of the electronic pen 10 to select between inking mode, wherein the electronic pen 10 writes ink or other markings on the paper or other surface with which the tip of the pen 10 comes into contact, and a non-inking mode, wherein the electronic pen 10 does not leave ink marks when the tip of the electronic pen 10 comes into contact with paper or other surfaces.

In accordance with the present invention, it is possible to turn the inking function of the electronic pen 10 on and off. In particular, a user of the electronic pen 10 can use the pen 10 with an ink cartridge extended in a writing position or with the ink cartridge retracted so that the electronic pen 10 does not leave ink markings. The ability to use the pen 10 with its inking function turned on allows users to keep a paper copy of any drawings, handwritten text, or other markings made with their electronic pen 10, while the ability to use the pen 10 in the non-inking mode facilitates use of the pen in connection with reusable or public data entry sheets or other public or reusable surfaces.

In another aspect of the invention, the electronic pen 10 can be used to navigate on a mobile phone 14 or other electronic device, such as a PDA, laptop computer, or personal computer, or to manipulate, enter, or delete data by writing on

a specially formatted paper. In particular, the electronic pen 10 can relay the written information to the mobile phone 14 or other electronic device. This use of the electronic pen 10 and specially formatted paper permits most messaging and telecommunications control functions to be performed in a user friendly manner without the use of other devices. Moreover, actions resulting from the use of the electronic pen 10 and specially formatted paper can be represented on a display of the mobile phone 14, PDA, or computer.

For example, there is illustrated in FIGURE 11, a reusable calendar entry sheet 220. It is assumed that the calendar entry sheet 220 is printed on a paper that includes a portion of the address pattern (not shown). Preferably, the address pattern is either not visible to the human eye or is only faintly visible so that the address pattern does not present a significant distraction to users. The sensor in the electronic pen 10, however, can detect the address pattern, and therefore, the precise position of the pen 10 at any given time can be determined, even when the pen is in a non-inking mode. Accordingly, when the electronic pen 10 is used to fill in a date field 222, the motion of the electronic pen 10 over the address pattern can be detected. Then, based on an analysis of the strokes, the handwritten date can be stored and/or converted into text. Similarly, appointment information or other data can be written in the appropriate fields of the calendar 224. By storing the detected positions, generating strokes based on the detected positions, and generating actions based on the strokes, the information written on the calendar can automatically be stored in a calendar application database (located, e.g., in a mobile phone 14 or in a remote server) associated with the user of the electronic pen 10. If desired, information can also be manipulated or deleted in a similar manner. Because the electronic pen 10 is preferably used in a

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non-inking mode, the calendar entry sheet 220 can be reused. Furthermore, the same types of functions can be used to enter, delete, and manipulate data in an electronic phone book, task list, or scheduler.

Referring now to FIGURE 12, there is illustrated an example of a reusable phone settings entry sheet 226. As with the previous example, it is assumed that the reusable phone settings entry sheet 226 is intended to be used when the electronic pen 10 is in a non-inking mode. Thus, by simply touching the electronic pen 10 to a desired setting in a ring volume field 228, the ring volume of a phone associated with, or otherwise selected by, the electronic pen 10, can be set. In addition, the electronic pen 10 can be used to select various other setting fields, such as a ring melody field 230, a greeting field 232, a phonebook entry field 234 for entering names and numbers into the phone internal memory, and fields relating to any other desired settings. When the electronic pen 10 is used to select or to enter information into these fields, such selections or entered information can be transmitted by the electronic pen 10 to the electronic pen client 22 contained within, for instance, a mobile phone 14.

Although the invention is described primarily in connection with a reusable calendar sheet 220 and a reusable phone setting entries sheet 226 in a non-inking mode, the invention is not limited to these applications. Instead, the electronic pen 10 can also be used for such data entry and storage when it is in an inking mode and can be used in connection with specially formatted paper to input any type of printed text or pattern in either the inking or non-inking mode. For example, the electronic pen 10 and an appropriately formatted paper or papers could also be used for navigating on a phone menu, dialing a number by writing it in a predefined "dialing" field, writing a message that is converted to a short

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message service (SMS' message, telefax, or email message in the phone or in the electronic pen client 22, or saving notes in the phone 14 or in the electronic pen client 22 in the form of graphical or ASCII text, characters, and/or pictures.

5   Similarly, the preprinted paper can comprise a calendar, phone book, or other type of personal information manager application, or the preprinted paper can be formatted to facilitate entry of settings in a phone, personal computer, or other electronic device capable of communicating with

10   electronic pen 10.   .

In accordance with another aspect of the present invention, the electronic pen 10 includes a paper touch sensor, or force sensitive detector, for determining when the electronic pen 10 is in contact with the paper. Preferably,

15   the paper touch sensor is used to enable and disable the position sensing mechanism in the electronic pen 10 depending upon whether the electronic pen 10 is in contact with either a paper or other surface, regardless of whether the electronic pen 10 is in an inking or non-inking mode. For example, the

20   paper touch senso.. can be used to enable the position FIFO Block 38 shown in FIGURE 7 when it senses that the electronic pen 10 is in contact with a paper or other surface and can be used to disable the position FIFO Block 38 when the paper touch sensor detects that the electronic pen 10 is not in contact

25   with any surface. Accordingly, the electronic pen 10 will detect positions and generate strokes and actions only when the paper touch sensor detects that the electronic pen 10 is in contact with a paper or other surface.

Referring now to FIGURES 13A and 13B, there is illustrated

30   an electronic pen 10 having a paper touch sensor 236 for detecting whether the electronic pen 10 is in contact with a paper 240 or other surface regardless of whether an ink cartridge 238 is in an extended, or ink-on, position (FIGURE

13A) or in a retracted, or ink-off, position (FIGURE 13B).
Alternatively, instead of using an ink cartridge 238, the
electronic pen 10 can utilize a pencil lead, a felt-tip marker,
or any other type of marking tip for writing on paper or other

5   surfaces.

        In yet another aspect of the present invention, the
electronic pen 10 can be used to perform a mouse function.
Accordingly, the electronic pen 10 can be used for navigation
purposes (e.g., in a navigation field) when the paper touch

10   sensor 236 detects that the electronic pen 10 is in contact
with a paper 240 or other surface. In addition, a selection at
a particular location can be indicated by "clicking" the tip of
the electronic pen 10 against the paper 240 or other surface
either by tapping the tip of the electronic pen 10 against the

15   paper 240 or other surface or by pressing the tip of the
electronic pen tip against the paper 240 or other surface with
additional force (i.e., a force greater than a predetermined
threshold force). When using the electronic pen 10 to perform
a mouse-like function, the ability to retract the ink cartridge

20   238 provides an additional benefit in that the electronic pen
10 is not writing and the ink cartridge 238 is not damaged when
the user "clicks" the electronic pen 10.

        In accordance with another aspect of the present
invention, an electronic reading device 10 can be used in

25   connection with a predefined address pattern on a specially
formatted surface 12 to activate a hyperlink. The hyperlink
could function in a way similar to existing web page hyperlinks
except that the hyperlink could be represented on any type of
addressed surface, electronic or non-electronic, rather than

30   just on a display screen. In other words, the hyperlink could
be printed on an addressed area of a paper, wherein a
particular Internet address is associated with the address
pattern contained in the addressed area. Thus, a textual or

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graphical identification of the hyperlink (visible and understandable to a user) can be printed on an addressed area, which is preferably only slightly visible and is not easily decipherable by a user.

In accordance with the invention, the hyperlink can initiate an execution of a function in the electronic reading device 10 or any other device. The types of functions can include a download or upload, to or from the electronic reading device 10 or other device, of text, images, executable software, audio, video, status information, control data, or position information. For example, by clicking on or touching the hyperlink with the electronic reading device, information could be retrieved from a remote server located at the Internet address and downloaded to the electronic reading device 10 or to another electronic device, such as a mobile phone, that has an Internet browser (e.g., a web browser or a wireless application protocol (WAP) browser). Similarly, an object or text printed on the addressed surface 12 can be associated with an electronic version of the object or text. Thus, touching the electronic reading device 10 to an image printed on the addressed surface 12 can retrieve a corresponding JPEG image, while touching a text area retrieves an audio copy of the text (e.g., for use in a newspaper for the visually handicapped). Alternatively, by clicking on or touching the hyperlink, information about the user of the electronic reading device 10 could be sent to a server for storage or processing.

Referring now to FIGURE 20, there is illustrated a schematic diagram of a hyperlink system 340 in accordance with a preferred embodiment of the present invention. When a user of the electronic reading device 10 touches or clicks on a hyperlink area 342 of a formatted surface 12 that includes a predefined address pattern, the electronic reading device 10 detects the hyperlink address pattern 342. Execution of a

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"click" can be done, for example, using optical or pressure
sensitive detectors on the electronic reading device 10, using
a click button on the electronic reading device 10, by simply
touching the tip of the electronic pen 10 to a certain position

5   or positions on the surface 12, by drawing a circle around a
certain area on the surface 12 or by drawing a symbol on a
certain area of the surface 12. The electronic reading device
10 then sends the detected address to a mobile phone 14 via a
Bluetooth™ interface 16. The mobile phone 14, in this case,

10   acts as an electronic reading device client 22 and, as
described above, uses the detected address to obtain a URL for
a server associated with the detected address. Alternatively,
the detected address can also be sent to other electronic
devices, such as a PC, PDA, or sent directly to a server.

15   Moreover, instead of using a radio interface, other types of
wireless technology, such as infrared light or inductive
coupling, or wired technology, such as cable connections, can
also be used.

Using a WAP browser or web browser, the mobile phone 14

20   then sends a message to a hyperlink server 348. The message
indicates that the hyperlink 342 has been selected and
preferably includes an electronic reading device identifier
and/or mobile phone identifier so that the hyperlink server 348
can identify the user. In particular, the message is sent over

25   a radio interface 18 to a base station 20, which forwards the
message via a general packet radio service network 344 and an
IP network 346 to the hyperlink server 348. After receiving
the message, the hyperlink server 348 can send a response to
the mobile phone 14 and/or the electronic reading device 10.

30   The response can include any type of information, such as a web
page, that is associated with the hyperlink. Alternatively,
the hyperlink server 348 can send information in the form of an
email to an email address associated with the user of the

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electronic reading device 10 and/or mobile phone 14. In another alternative, the hyperlink server 348 can simply store an indication that the user has selected the hyperlink or can perform some type of processing of data received in the message.

Such a hyperlink system 340 can be used for a wide variety of applications. In one embodiment of the invention, the hyperlink system 340 can be used to obtain more information about a product. The hyperlink address pattern 342 is included on a product, on product packaging, or in a product advertisement. When the hyperlink address pattern 342 is detected by the electronic reading device 10, additional product information is retrieved via the Internet and displayed on the mobile phone display 350.

In another embodiment of the invention, hyperlink address patterns 342 can be included in newspapers and books. Information could then be downloaded to an electronic device, in the form of text, still images, video, or audio, depending on the capabilities of the electronic device. For example, textual information could be sent to the mobile station 14 or a web-based version of a related article, or a link thereto, could be attached to an email delivered to the user's email address.

In another alternative embodiment, a hyperlink address pattern 342 is printed on part of a business card or identification card. By detecting the hyperlink address pattern 342 with the electronic reading device 10, contact information (e.g., a vCard) or other personal information is downloaded to the mobile phone 14 or to a PDA.

Another embodiment of the invention facilitates retrieving timetable information. By including a hyperlink address pattern 342 at a bus stop, a timetable can be retrieved and downloaded to the mobile phone 14 when the electronic reading

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device 10 is scanned over or clicked on the hyperlink address pattern 342. Furthermore, by using a hyperlink address pattern 342 that is unique for the particular bus stop, the hyperlink server 348 can identify the particular bus stop at which the user is located. Accurate information about when the next bus should arrive, including any delays, can then be sent to the mobile station 14 in the form of text or audio. Accordingly, the user could receive a voice message stating, for example, that "the bus will arrive at this stop in ten minutes."

In another embodiment, the hyperlink address pattern can be used as an alternative to bar codes and magnetic strips. Thus, by scanning the hyperlink address pattern 342, the hyperlink server 348 can identify the entity or object with which the hyperlink address pattern 342 is associated.

In yet another embodiment, a museum, zoo, amusement park, or other attraction can have a hyperlink address pattern 342 placed in front of certain objects or areas (e.g., on signs associated with individual exhibits). By detecting the hyperlink address pattern 342 with the electronic reading device 10, information or a link thereto can be sent in an email to the user's email address for reading at home.

In another embodiment, different hyperlink address patterns 342 can be used to conveniently and quickly select and set office messages. For example, by using the electronic reading device 10 to select a state, such as "Out of office," "Lunch," etc., the user's phone mail and email settings could automatically be programmed with appropriate messages. In addition, visitors could use their own electronic reading device 10 to select a hyperlink address pattern 342 outside of the user's office to retrieve, to the visitor's mobile phone, a message containing the state currently selected by the user.

In another embodiment of the invention, delivery persons can use an electronic reading device 10 on a hyperlink address

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pattern 342 at delivery locations to verify that they are at the correct location. In addition, the hyperlink server 348 could store a confirmation that the delivery person has actually been to a particular location along with the time of

5   arrival.

In yet another alternative embodiment of the invention, a hyperlink address pattern 342 can be used instead of normal text or magnetic strips on tickets. The hyperlink address pattern 342 could then be scanned to authenticate the ticket.

10   Alternatively, both text and the hyperlink address pattern 342 can be used so that the ticket can be both visually read by the user and electronically detected by an electronic reading device 10.

Although various preferred embodiments of the method and

15   apparatus of the present invention have been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it is understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substitutions without

20   departing from the spirit of the invention as set forth and defined by the following claims. Furthermore, it shall be understood that the terms "comprises" and "comprising," when used in the foregoing Detailed Description and the following claims, specifies the presence of stated features, elements,

25   steps, or components but does not preclude the presence or addition of one or more other features, elements, steps, components, or groups thereof.

WHAT IS CLAIMED IS:

1.   A system for electronic data entry, comprising:
        an electronic reading device, including:
                an optical detector for detecting a portion of
a predefined address pattern on a specially formatted
surface to the electronic reading device; and
                a transmitter for transmitting data relating to
the detected portion of the predefined address pattern;
                a separate electronic device for receiving the
transmitted data and for performing a function corresponding to
an area of the predefined address pattern that includes the
detected portion of the address pattern.

2.   The system of claim 1, wherein the transmitter
comprises a cable.

3.   The system of claim 1, wherein the transmitter
transmits information via a local wireless link.

4.   The system of claim 3, wherein the local wireless
link comprises a Bluetooth radio interface.

5.   The system of claim 1, wherein the separate
electronic device is selected from the group consisting of a
mobile phone, a personal digital assistant, a television, and
a personal computer.

6.   The system of claim 5, wherein the function comprises
manipulating at least one setting for the separate electronic
device.

7.   The system of claim 5, wherein the function comprises
navigating an options menu for the separate electronic device.

8.   The system of claim 7, wherein a display on the
separate electronic device displays at least a portion of the
options menu.

9. The system of claim 1, wherein the optical detector detects a plurality of locations on the predefined address pattern corresponding to at least one image formed by the electronic reading device on the specially formatted surface, the transmitter transmits data relating to the plurality of detected locations, and the separate electronic device receives the transmitted data and uses the received data in performing the function.

10. The system of claim 9, wherein the at least one image comprises at least one handwritten character.

11. The system of claim 9, wherein the separate electronic device comprises a mobile phone.

12. The system of claim 11, wherein the mobile phone converts the received data into one of a short message service (SMS) message, a telefax, and an electronic mail.

13. The system of claim 11, wherein the at least one image comprises a handwritten telephone number, the mobile phone operating to dial the telephone number.

14. The system of claim 8, wherein the specially formatted surface comprises a calendar manipulation form, the separate electronic device converting the received data into data for entry in a calendar stored in the separate electronic device.

15. The system of claim 8, wherein the specially formatted surface comprises an email form, the separate electronic device operating to convert the received data into an email for transmission by the separate electronic device.

16. The system of claim 8, wherein the specially formatted surface comprises a phonebook manipulation form, the separate electronic device converting the received data into data for entry in a phonebook stored in the separate electronic device.

17.   The system of claim 8, wherein the separate electronic device stores the received data in the form of a graphical image.

18.   The system of claim 8, wherein the separate electronic device converts the received data into text.

19.   The system of claim 8, wherein the specially formatted surface comprises a task list manipulation form, the separate electronic device converting the received data into data for entry in a task list stored in the separate electronic device.

20.   The system of claim 1, wherein the electronic reading device further includes a controller for sending the data relating to the detected portion of the predefined address pattern.

21.   The system of claim 1, wherein the separate electronic device comprises a server.

22.   The system of claim 21, wherein the function comprises a script corresponding to the detected portion of the address pattern.

23.   The system of claim 22, wherein the script is executed by the server.

24.   The system of claim 22, wherein the script is delivered to a second separate electronic device for execution by the second separate electronic device.

25.   The system of claim 21, wherein the function comprises a handwriting recognition application.

26.   The system of claim 25, wherein the function further comprises converting handwriting to text.

27.   The system of claim 21, wherein the function comprises a language translation application.

28.   The system of claim 21, wherein the function comprises a spelling help application.

29. The system of claim 21, wherein the function comprises creating an electronic credit card receipt.

30. The system of claim 21, further comprising an electronic device having a display, wherein the function comprises sending information to the electronic device for displaying on the display.

31. The system of claim 30, wherein the function is selected from the group consisting of displaying a web page on the display, displaying product information on the display, and displaying a translated word on the display.

32. The system of claim 21, further comprising an electronic device selected from the group consisting of a mobile phone, a personal digital assistant (PDA), a television, and a personal computer, wherein the function comprises sending information to the electronic device, said information selected from the group consisting of an audio message for playback by a speaker on the electronic device and a textual message for display on a screen of the electronic device.

33. The system of claim 21, wherein the specially formatted surface is preprinted with at least one icon, wherein a portion of the address pattern on which the at least one icon is preprinted is associated with the function.

34. The system of claim 21, further comprising a notebook that includes a plurality of sheets of paper, each sheet of paper including an area of the address pattern associated with a particular application, wherein the server executes a particular application in response to a detection by the sensor of an area associated with the particular application.

35. The system of claim 34, wherein the server monitors usage of the sheets of paper and sends a message prompting a user to obtain more paper based on said monitored usage.

36. The system of claim 21, wherein the function comprises sending a message over the Internet.

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37.   The system of claim 36, wherein the message is selected from the group consisting of an email, a telefax, and a short message service (SMS) message.

38.   A method for data entry using an electronic reading device, comprising the steps of:

detecting at least one position of an electronic reading device relative to a predefined address pattern on a specially formatted surface;

transmitting data relating to the at least one detected position;

receiving the transmitted data; and

performing an operation using the received data, said operation corresponding to an area that contains the at least one detected position.

39.   The method of claim 38, wherein the operation comprises manipulating settings for a mobile device.

40.   The method of claim 38, wherein the operation comprises navigating in an options menu of a mobile phone.

41.   The method of claim 38, wherein the operation comprises entering data corresponding to the at least one detected position in an electronic calendar.

42.   The method of claim 38, wherein the operation comprises converting the at least one detected position into a short message service (SMS) message.

43.   The method of claim 38, wherein the at least one detected position corresponds to a handwritten telephone number, the operation comprising converting the at least one detected position into the telephone number.

44.   The method of claim 38, wherein the operation comprises converting the at least one detected position into an email message.

45.   The method of claim 38, wherein the operation comprises entering data corresponding to the at least one detected position in an electronic phone book.

46.   The method claim 38, wherein the at least one detected position corresponds to handwritten information, the operation comprising saving the information in a memory.

49.   The method of claim 38, wherein the operation comprises entering data corresponding to the at least one detected position in an electronically stored task list.

48.   The method of claim 38, wherein the step of transmitting data relating to the at least one detected position comprises transmitting the data via a local wireless link.

49.   An electronic data entry system, comprising:

a formatted paper having printed thereon a predefined address pattern;

an electronic reading device for detecting portions of the predefined address pattern and relaying information relating to the detected portions of the predefined address pattern; and

a mobile phone for receiving the relayed information, wherein a user of the mobile phone can utilize the relayed information to execute a function within the mobile phone.

50.   A method of using an electronic reading device, comprising the steps of:

detecting information written with an electronic reading device on formatted paper that includes a predefined address pattern;

relaying the detected information to a mobile phone; and

utilizing the relayed information to execute a function within the mobile phone.

51.   An electronic reading device, comprising:

a sensor for detecting at least a portion of a pattern on a specially formatted surface;

a memory for storing a predefined function corresponding to the pattern; and

a controller for performing the predefined function when the sensor detects at least a portion of the pattern.

52.   The electronic reading device of claim 51, wherein the memory stores a plurality of predefined functions, each predefined function corresponding to at least one specific pattern, and wherein the controller performs the corresponding predefined function when the sensor detects at least a portion of the at least one specific pattern.

53.   The electronic reading device of claim 51, wherein the sensor comprises a camera.

54.   The electronic reading device of claim 51, wherein the predefined function performed by the controller involves interacting with at least one other electronic device that further performs an additional function relating to the detected pattern.

55.   The electronic reading device of claim 51, wherein the predefined function comprises sending information to a separate electronic device.

56.   The electronic reading device of claim 55, wherein the predefined function is selected from the group consisting of sending information to an address on the Internet and sending information to one of a mobile phone, a personal digital assistant (PDA), a television, and a personal computer.

57.   The electronic reading device of claim 55, wherein the separate electronic device maps the information received from the controller to a particular server based on the detected pattern.

58. The electronic reading device of claim 51, wherein the predefined function comprises storing information.

59. The electronic reading device of claim 51, wherein the predefined function comprises deleting information from a memory.

60. The electronic reading device of claim 51, wherein the predefined function includes retrieving information from a memory.

61. The electronic reading device of claim 60, wherein the retrieved information is selected from the group consisting of predetermined text and a predetermined image.

62. The electronic reading device of claim 51, wherein the predefined function comprises requesting that certain information be displayed on a display.

63. The electronic reading device of claim 51, wherein the controller further compares the detected pattern with a pattern stored in the memory to determine whether the detected pattern matches the stored pattern.

64. The electronic reading device of claim 51, wherein the pattern comprises a portion of an overall address pattern formatted such that a substantially exact location on the overall address pattern can be identified based on an examination of a portion of the overall address pattern that is adjacent to the location.

65. The electronic reading device of claim 51, wherein the pattern comprises a symbol printed on the specially formatted surface.

66. A method of using an electronic reading device, comprising the steps of:

reading, with the electronic reading device, at least a portion of a specific pattern printed on a specially formatted paper;

identifying a specific function associated with the specific pattern; and

performing the specific function.

67. The method of claim 66, wherein the specific pattern comprises a symbol.

68. The method of claim 66, wherein the specially formatted paper comprises a plurality of predefined areas, each associated with a predetermined function, one of the plurality of predefined areas including the specific pattern and associated with the specific function.

69. The method of claim 68, further comprising the steps of:

storing a first plurality of the predetermined functions in the electronic reading device;

storing a second plurality of the predetermined functions in at least one separate electronic device; and

contacting the at least one separate electronic device to perform the specific function when the first plurality of predetermined functions does not include the specific function associated with the specific pattern.

70. The method of claim 69, further comprising the step of retrieving an application description associated with the specific pattern.

71. The method of claim 66, wherein the specific function is selected from the group consisting of sending information to a separate electronic device, storing information, and deleting information.

72.   The method of claim 66, wherein the specific pattern comprises an arrangement of dots on the specially formatted paper.

73.   The method of claim 66, wherein the step of reading at least a portion of the specific pattern involves reading a portion of the specific pattern substantially smaller than an area covered by the specific pattern.

74.   The method of claim 66, wherein the specific pattern comprises a portion of an overall address pattern, different portions of the overall address pattern corresponding to different functions.

75.   The method of claim 66, wherein the step of identifying the specific function further comprises transmitting information relating to the read portion of the specific pattern from the electronic reading device to a server.

76.   The method of claim 66, wherein the step of performing the specific function comprises executing a script.

77.   The method of claim 66, wherein the function comprises a handwriting to text translation.

78.   The method of claim 66, wherein the function comprises a language translation application.

79.   The method of claim 66, wherein the function comprises a spell help application.

80.   The method of claim 66, wherein the function comprises sending information to a mobile electronic device.

81.   The method of claim 66, wherein the function comprises accessing a web page.

82.   The method of claim 66, wherein the function comprises creating an electronic credit card receipt.

83.   The method of claim 66, wherein the function comprises retrieving product information.

84.   The method of claim 66, wherein the function comprises generating one of an email, a telefax, and a short message service (SMS) message.

85.   The method of claim 66, wherein the specific pattern is associated with an icon printed on a specially formatted paper.

86.   The method of claim 66, further comprising the step of identifying a sheet of paper having printed thereon the specific pattern, said identification performed using the read specific pattern, wherein the sheet of paper corresponds to at least one application executable on an electronic device.

87.   An electronic reading device, comprising:

a sensor for detecting symbols as the symbols are written on a surface with the electronic reading device;

a memory for storing at least one predefined symbol; and

a processor for comparing a symbol detected by the sensor with the at least one predefined symbol stored in the memory and, if there is a match, executing a function corresponding to the detected symbol.

88.   The electronic reading device of claim 87, wherein the sensor detects symbols by monitoring movement of the electronic reading device relative to an address pattern of the surface.

89.   The electronic reading device of claim 88, wherein the function executed by the processor further corresponds to the area of the address pattern on which the detected symbol is written.

90.   A method of using an electronic reading device, comprising the steps of:

detecting a symbol written with the electronic reading device on a specially formatted surface;

comparing the detected symbol with each of at least one stored symbol; and

performing a function associated with one of the at least one stored symbol if the detected symbol matches said one of the at least one stored symbol.

91.   The method of claim 90, wherein the at least one stored symbol and the function associated with said one of the at least one stored symbol are stored in a server, further comprising the step of sending information relating to the detected symbol to the server.

92.   The method of claim 91, wherein the information relating to the detected symbol is sent using a web browsing protocol.

93.   The method of claim 91, further comprising the step of executing a script stored in the server in response to the detected symbol.

94.   The method of claim 90, where the step of detecting the written symbol comprises detecting a movement of the electronic reading device relative to an address pattern of the specially formatted surface.

95.   The method of claim 94, wherein the function associated with said one of the at least one stored symbol is further associated with an area of the address pattern on which the detected symbol is written.

96.   The method of claim 90, wherein the function associated with said one of the at least one stored symbol is selected from the group consisting of retrieving predetermined text and retrieving a predetermined image.

97. An electronic reading system, comprising:

a formatted surface having an area that includes a specific part of an address pattern, wherein a unique position on the address pattern can be identified from an examination of a portion of the address pattern;

an electronic reading device including a sensor for detecting at least a portion of the specific part of the address pattern; and

a server associated with the specific part of the address pattern for receiving a message from the electronic reading device, said message sent in response to said detection, and for performing a function in response to said message.

98. The system of claim 97, wherein the address pattern comprises a pattern of dots.

99. The system of claim 97, wherein said area of the formatted surface further includes printed hyperlink identification information.

100. The system of claim 99, wherein the printed hyperlink identification information comprises a printed image, said function performed by the server comprising retrieving an electronic copy of the printed image.

101. The system of claim 99, wherein the printed hyperlink identification information comprises text, said function performed by the server comprising retrieving an audio copy of the text.

102. The system of claim 97, wherein the function comprises sending information associated with the specific part of the address pattern to an electronic device associated with a user of the electronic reading device.

103. The system of claim 97, wherein the function comprises sending information associated with the specific part of the address pattern to an email address associated with a user of the electronic reading device.

104. The system of claim 97, wherein the electronic reading device further includes a radio transmitter for sending data relating to the detected specific part of the address pattern to the server.

105. The system of claim 104, further comprising a mobile station for receiving said data and for sending said message to the server.

106. The system of claim 105, wherein the function comprises sending information associated with the specific part of the address pattern to the mobile station.

107. The system of claim 106, wherein the mobile station includes an Internet browser, said information comprising a web page.

108. The system of claim 97, wherein the electronic reading device sends data relating to the detected specific part of the address pattern to the server using one of an infrared data transmission, inductive coupling, and a cable connection.

109. The system of claim 97, wherein the specific part of the address pattern relates to a product, the function comprising sending product information.

110. The system of claim 97, wherein the formatted surface comprises a part of a printed publication.

111. The system of claim 97, wherein the formatted surface comprises a business card.

112. The system of claim 97, wherein the function comprises retrieving a transportation timetable.

113. The system of claim 97, wherein the specific part of the address pattern is associated with an object and the function comprises retrieving an identification of the object based on the specific part of the address pattern.

114. The system of claim 113, wherein the server further sends an authentication of the object.

115. The system of claim 97, wherein the specific part of the address pattern corresponds to an office message state.

116. The system of claim 115, wherein the function comprises activating one of a phone mail message associated with the office message state and an email response message associated with the office message state.

117. The system of claim 97, wherein the specific part of the address pattern corresponds to a geographical location.

118. The system of claim 117, wherein the function comprises storing an indication that the specific part of the address pattern has been detected by the electronic reading device.

119. A method for selecting a hyperlink address, comprising the steps of:

    detecting a portion of an address pattern on a formatted surface of an object using an electronic reading device;

    identifying an Internet address corresponding to the detected portion of the address pattern;

    sending a message to the identified Internet address; and

    performing an operation in a server for the identified Internet address in response to the message.

120. The method of claim 119, wherein the operation comprises sending data to a client address associated with the electronic reading device.

121. The method of claim 120, wherein the client address identifies one of a user email address and a user electronic device.

122. The method of claim 121, wherein the data comprises product information.

123. The method of claim 121, wherein the object comprises a printed publication.

124. The method of claim 121, wherein the object comprises a business card.

125. The method of claim 121, wherein the data comprises transportation schedule information.

126. The method of claim 121, wherein the data comprises an identification of the object.

127. The method of claim 121, wherein the data comprises information regarding an attraction.

128. The method of claim 121, wherein the data comprises location information relating to a geographical location of the object.

129. The method of claim 119, wherein the operation comprises authenticating the object.

130. A user interface system, comprising:

a specially formatted surface having printed thereon an address pattern;

an electronic reading device, including:

a sensor for detecting at least one position of the electronic reading device relative to a portion of the address pattern adjacent to the electronic reading device; and

a controller for sending information relating to the at least one detected position;

a server for receiving the information relating to the at least one detected position and executing a function corresponding to the at least one detected position.
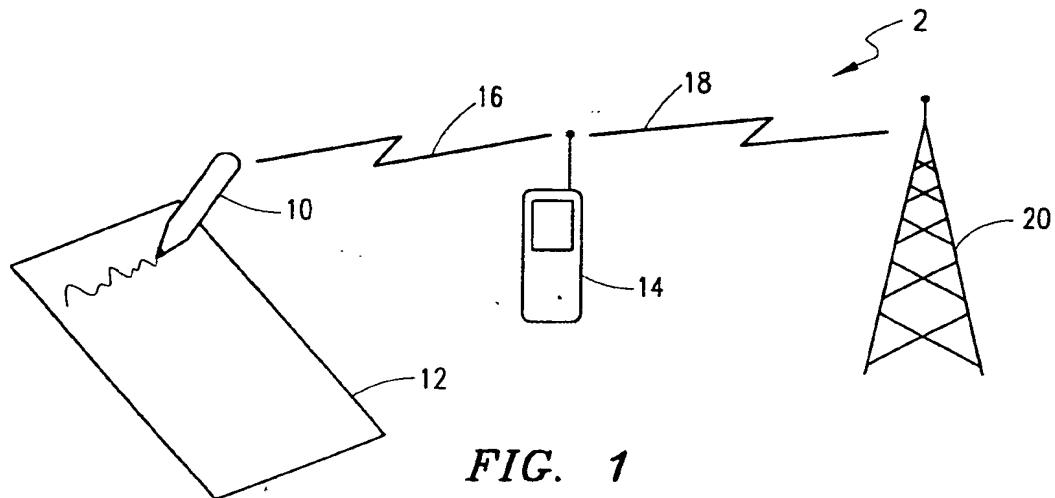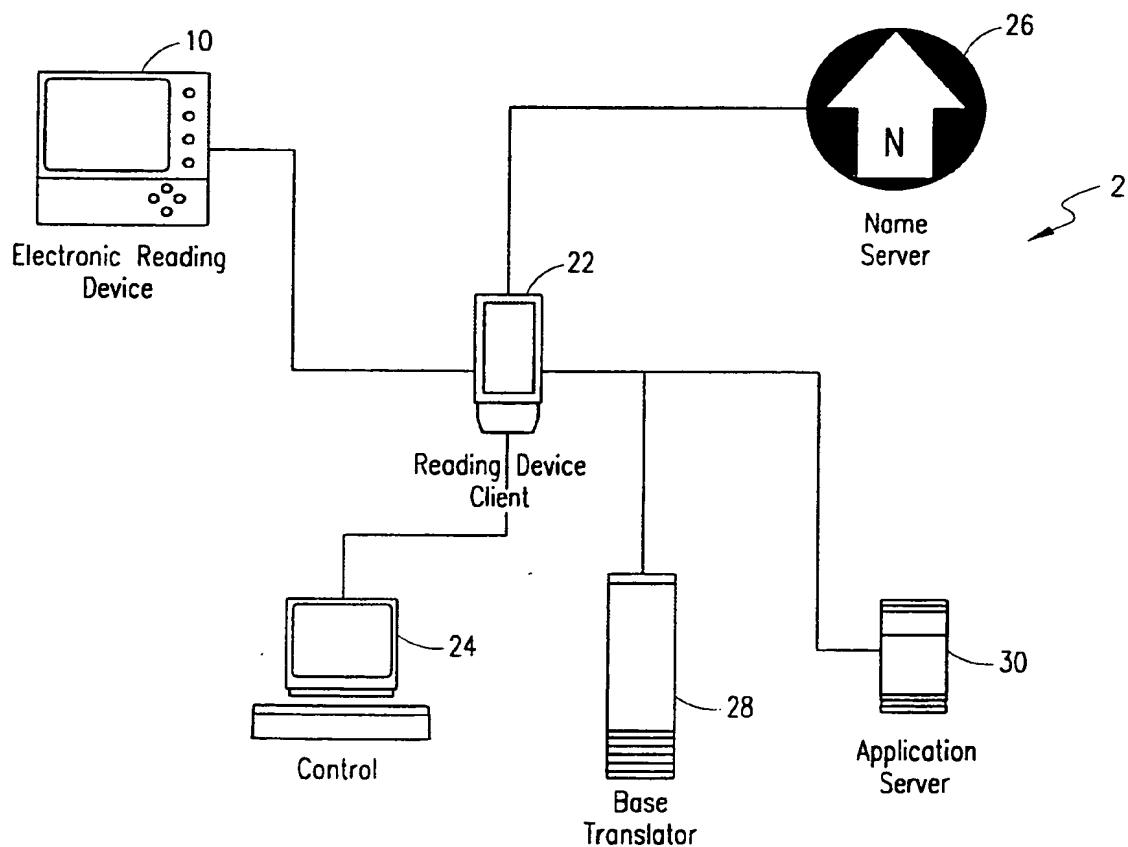
FIG. 1

FIG. 2

| Electronic Pen |
| --- |
| WSP Server |
| (WTP) |
| UDP/IP |
| . . . |

Electronic Pen Client
WSP Server
(WTP)
UDP/IP
. . .

FIG. 3

Electronic Pen
WSP Server
(WTP)
UDP/IP
. . .

WAP GW	
WSP GW	HTTP Client
(WTP)	
UDP/IP	TCP/IP
. . .	. . .

Electronic Pen Client
HTTP Server
TCP/IP
. . .

FIG. 4

Electronic Pen
WSP Server
(WTP)
UDP/IP
. . .

WAP GW	
WSP GW	HTTP Client
(WTP)	
UDP/IP	TCP/IP
. . .	. . .

Supporting Entity
HTTP Server
TCP/IP
. . .

FIG. 5

Client
HTTP Client
TCP/IP
. . .

Supporting Entity
HTTP Server
UDP/IP
. . .
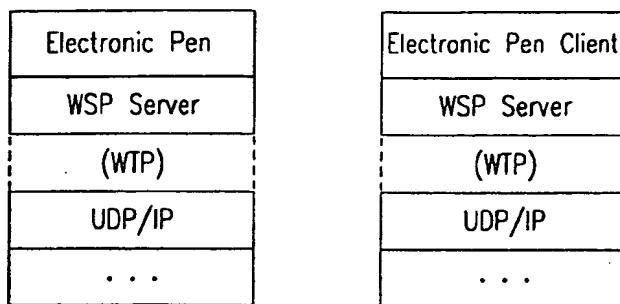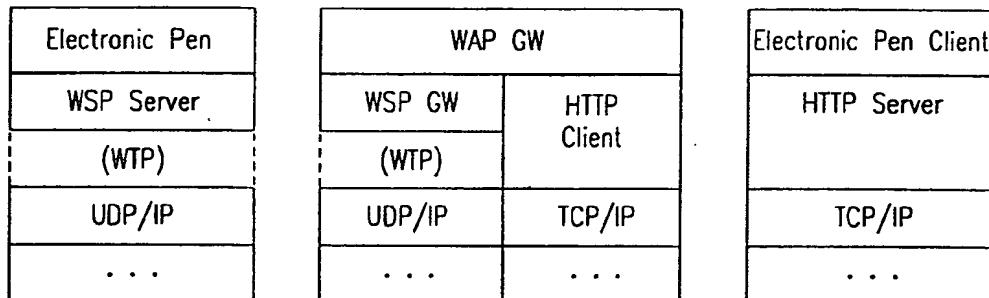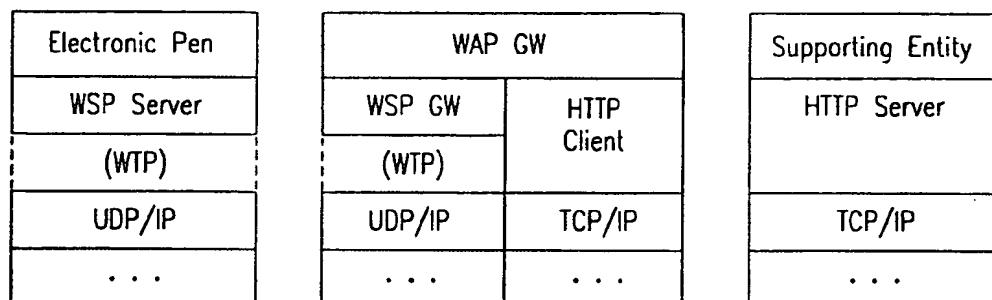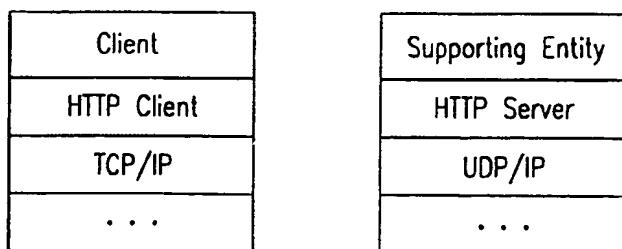
FIG. 6
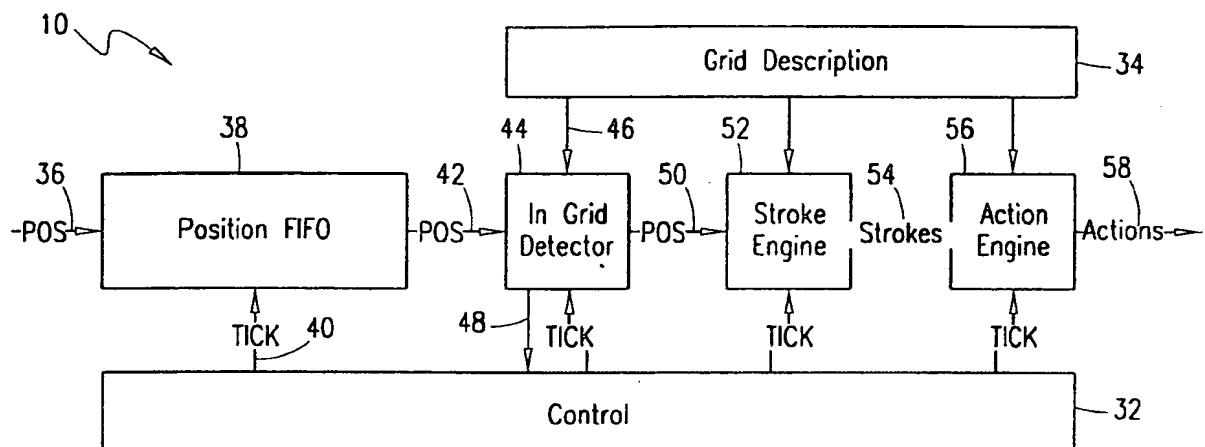
FIG. 7
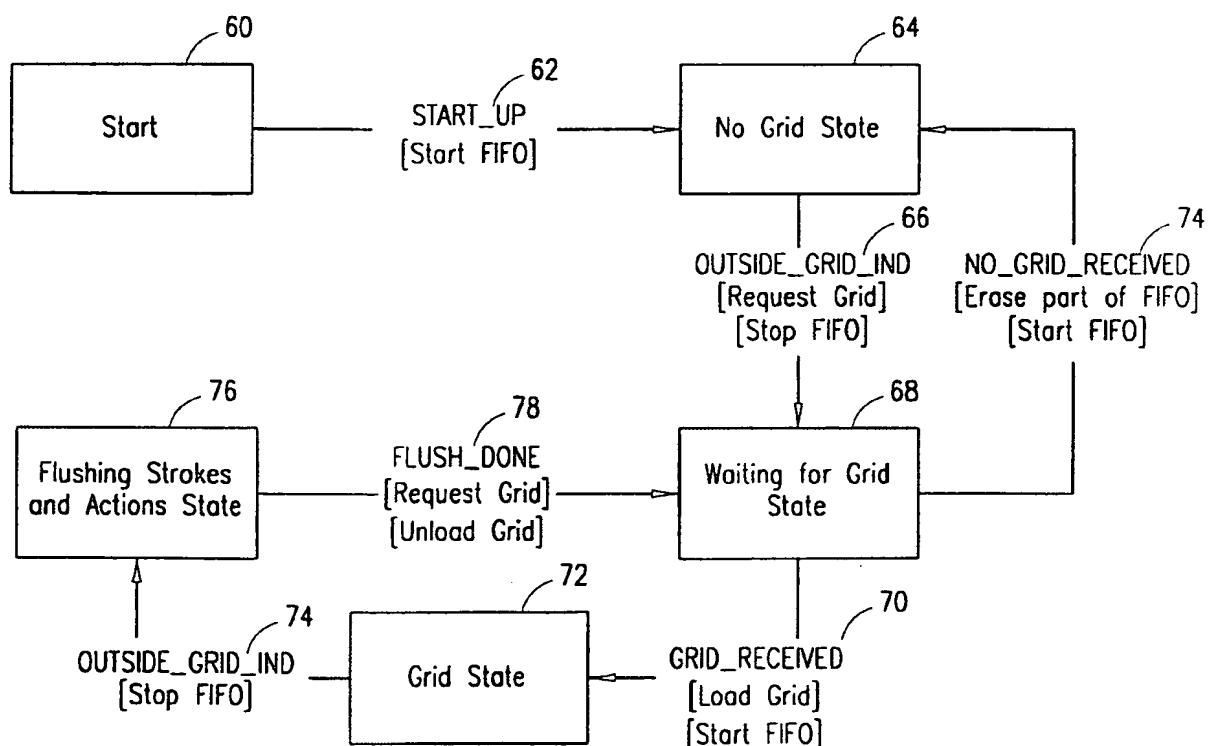
FIG. 8
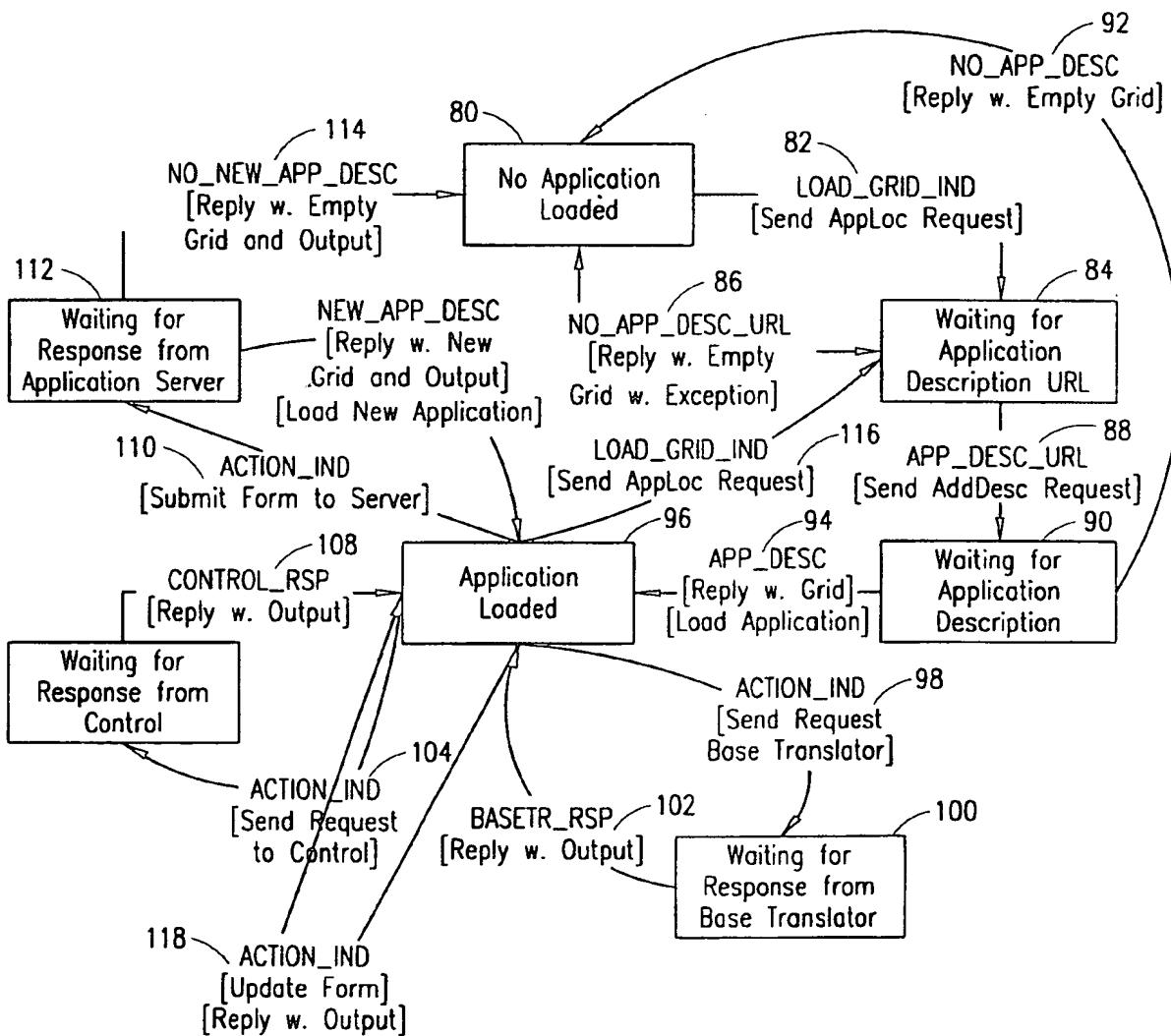
FIG. 9
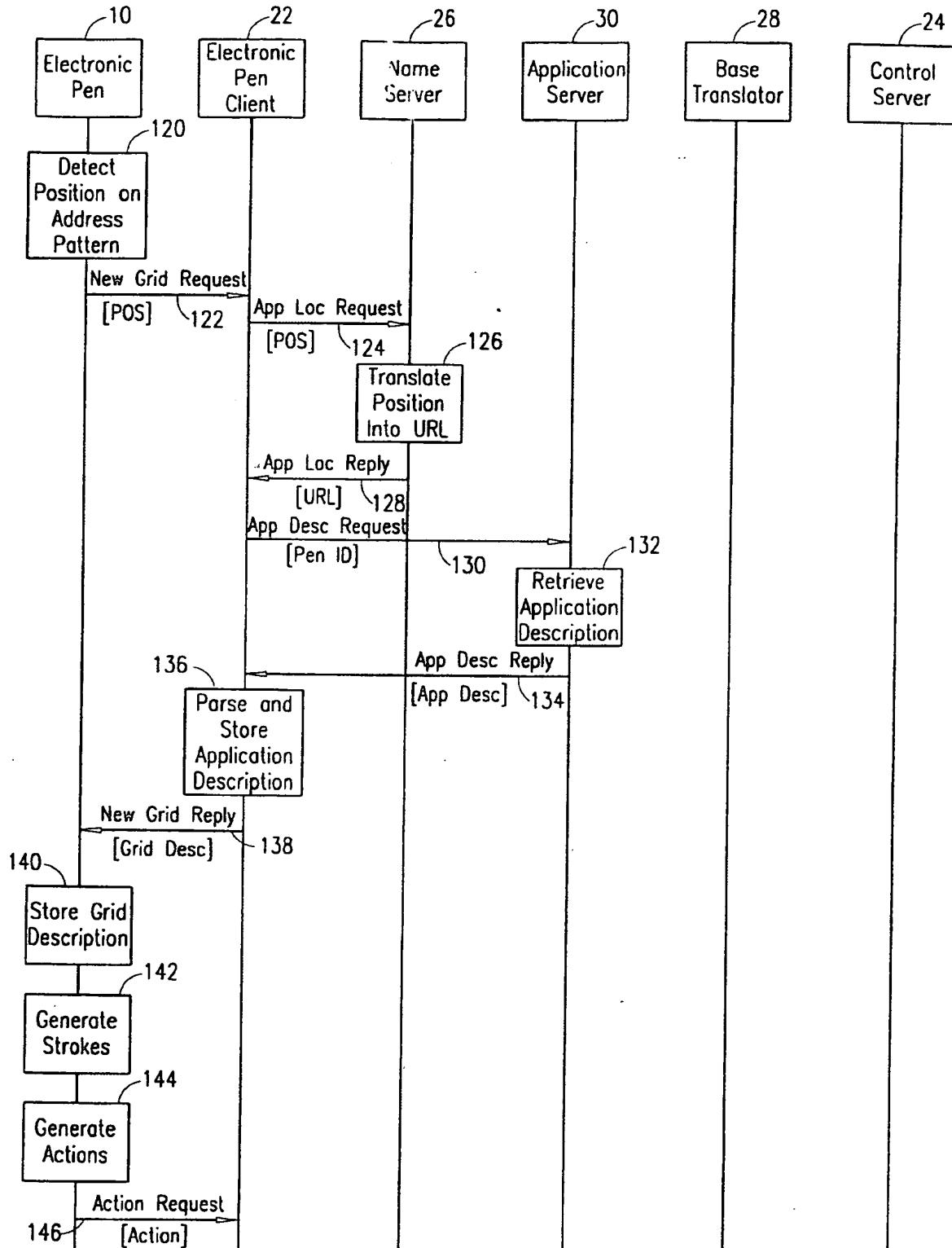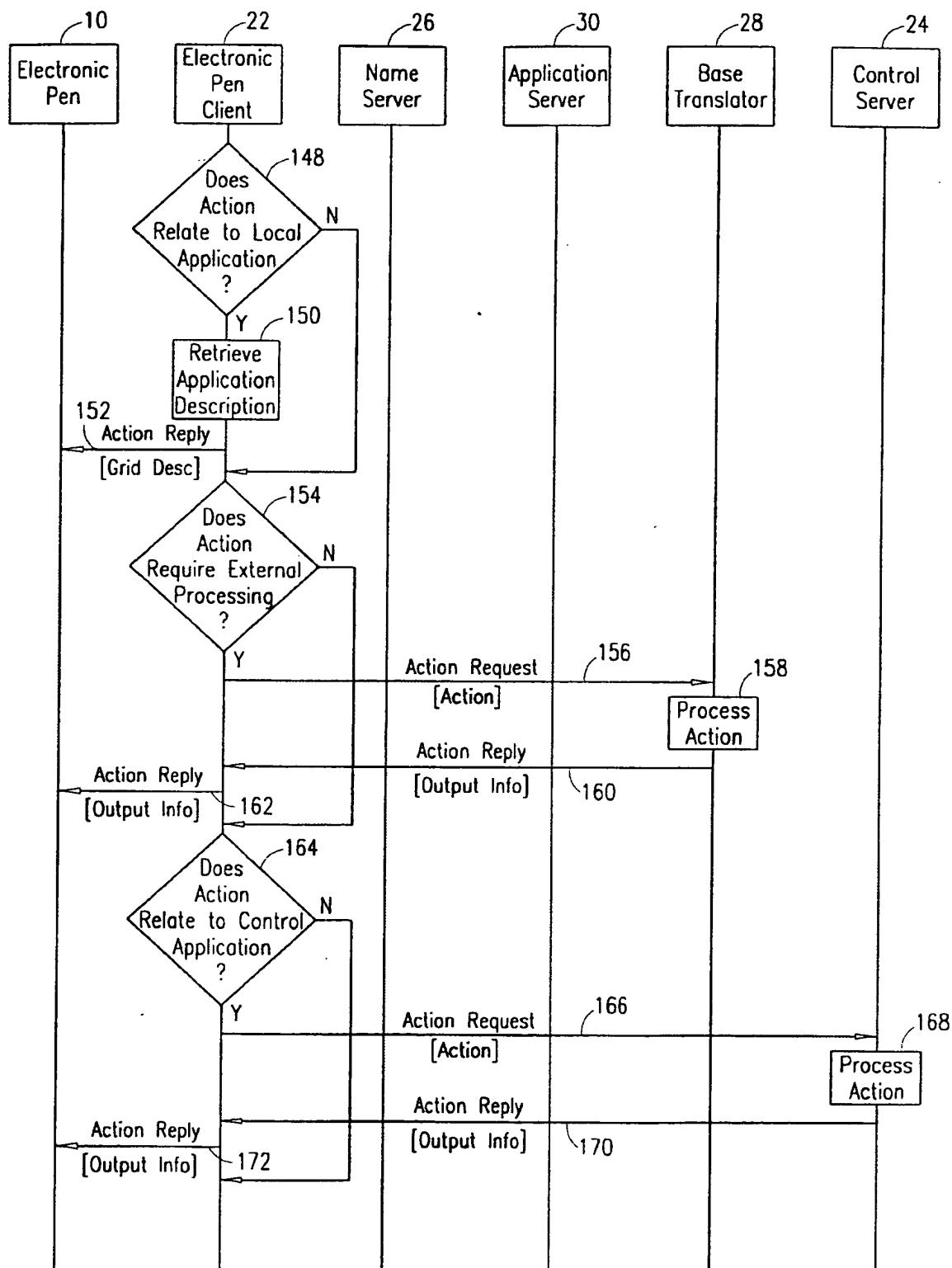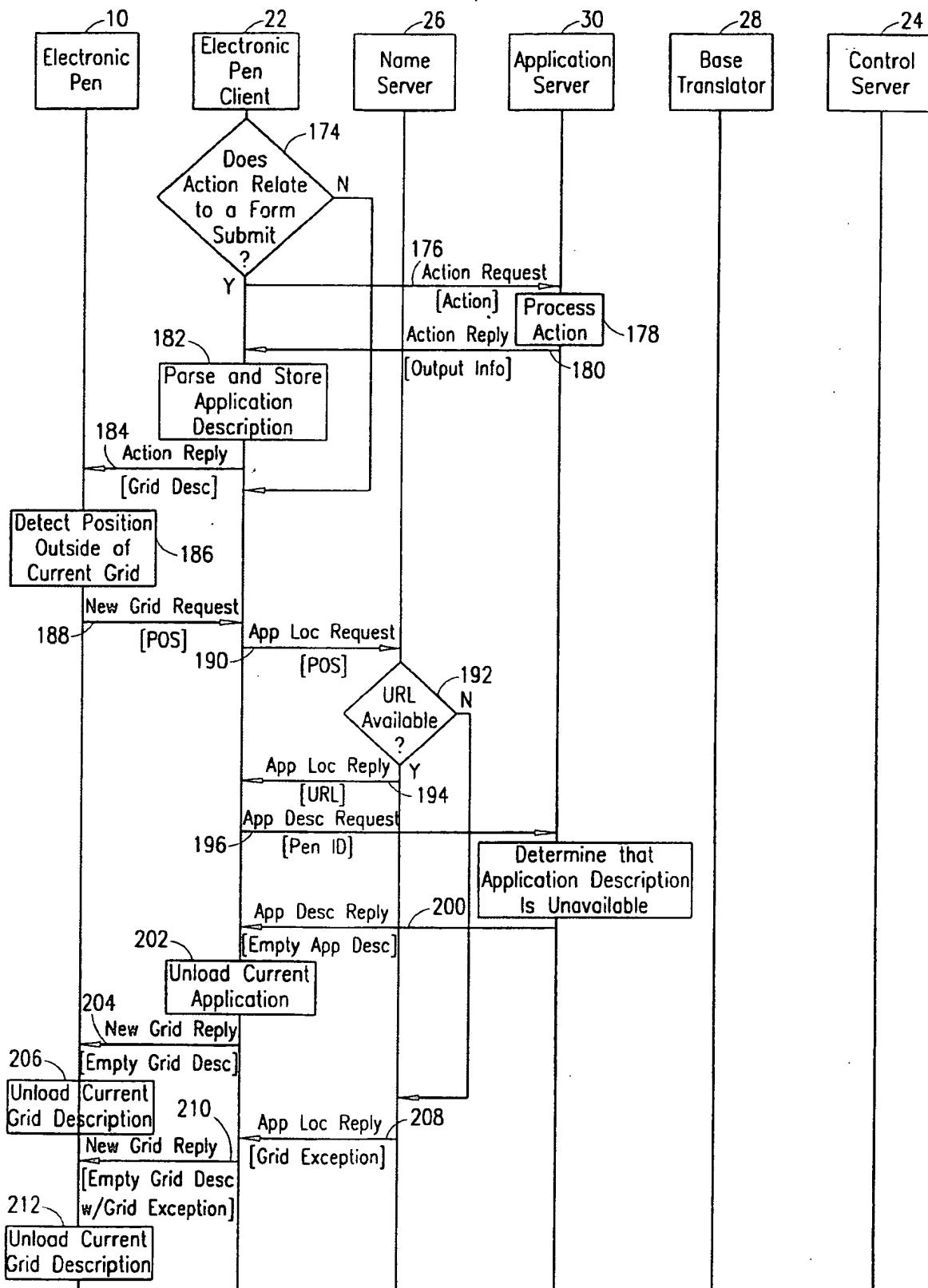
FIG. 10A

FIG. 10B

FIG. 10C

REUSABLE CALENDAR ENTRY SHEET (PLEASE NO INK)

220

DATE   222

| | | |
Day Mo. Yr.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
0800							
1000								224
1200							
1400							
1600							
1700							

FIG. 11

REUSABLE PHONE SETTINGS ENTRY SHEET (PLEASE NO INK)

226

230

Ringer Volume [| | | |] 228   Ringer Melody

Greeting 232

Phone Memory:
NAME   NUMBER   234

| | | |

FIG. 12

FIG. 13A

FIG. 13B

FIG. 14

Handwriting to Text Conversion Area:

— 260

Convert — 262

Translation Area:

To: French — 266
English
German

— 264

Translate — 268

URL=Web Page

— 270

Connect — 272

Search

— 274

Search — 276

FIG. 15

—280

Credit Card Receipt

Andy Smith
Visa No.
123456789012 exp.12/00

Signature   Total
            Amount   — 284

282

FIG. 16

FIG. 17

312   314   310
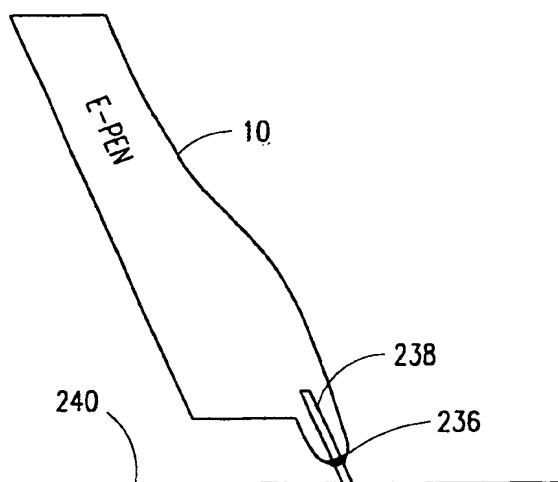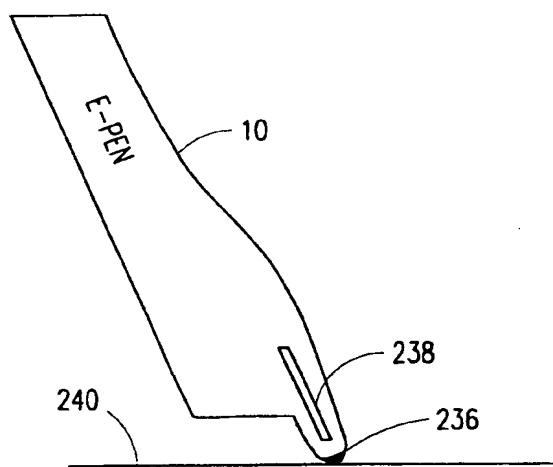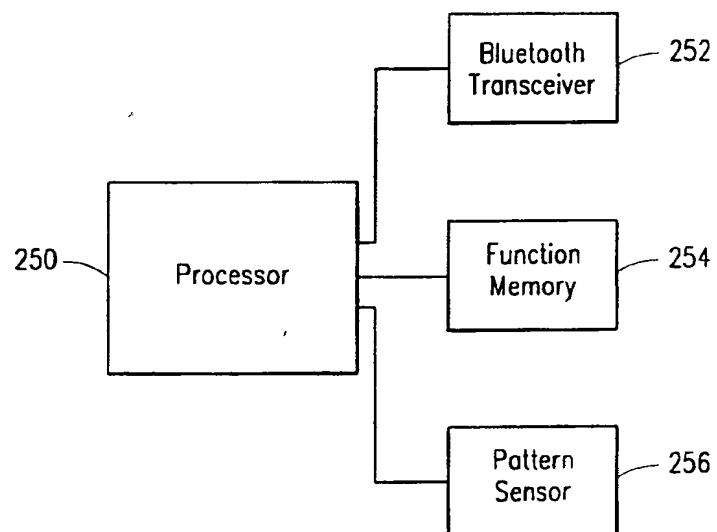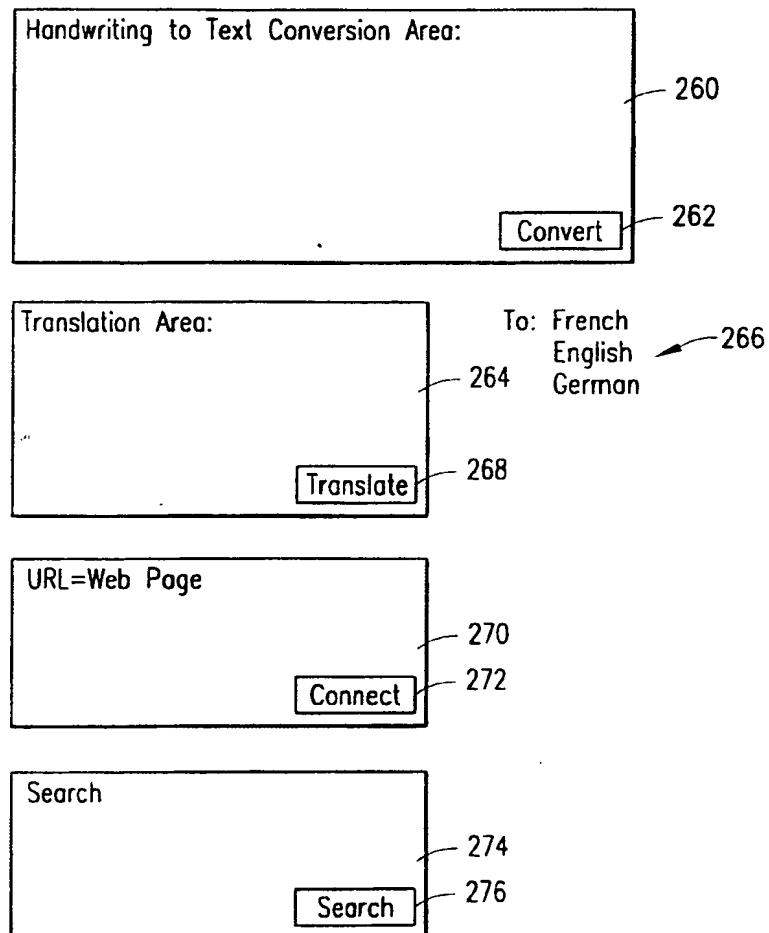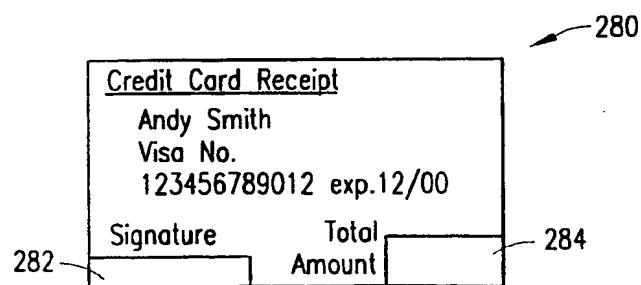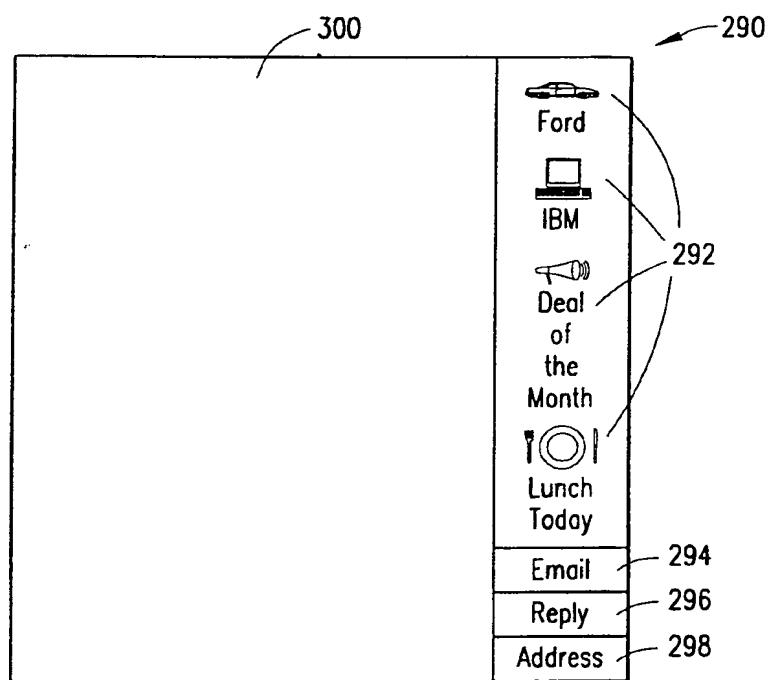
Page Identifier: "Email59"	Reply		Send
	Copy To		Translate

Hi,

How are you doing?

John

To: nils@ericcson.com	CC: orjan@ericcson.com

318   318

FIG. 18

Really Quick Email: Page 3												
Hi	My Name		Meeting	Love	O'Clock	Urgent	Angry
Weekdays:	S	M	T	W	T	F	S	Greetings	My Photo
1	2	3	4	5	6	7	8	9	0	Yours Sincerely		

328

Message Pad:

To:

326

322

Most Frequent Addresses

1	2	3	4	5	6	7	8	To Myself	Reply	Send		

320

328   324

FIG. 19

FIG. 20